

FLIGHT

The
AIRCRAFT ENGINEER
AND AIRSHIPS

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Founder and Editor: STANLEY SPOONER

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DIARY OF CURRENT AND FORTHCOMING EVENTS

Club Secretaries and others desirous of announcing the dates of important fixtures are invited to send particulars for inclusion in this list:—

- 1934.
- Mar. 24. Services Rugby: R.A.F. v. Army, at Twickenham.
- Mar. 28. Royal Aero Club Annual General Meeting.
- Apr. 5. "Engines." Lecture by Capt. A. G. Forsyth before R.Ae.S.
- Apr. 7-10. Forum Club Aviation Exhibition.
- Apr. 12. "Speed and the Future of Commercial Aircraft." Lecture by M. Louis Breguet before R.Ae.S.
- Apr. 16 23, 30. "Gyroscopes." Series of Lectures by Prof. J. G. Gray before Royal Society of Arts.
- Apr. 22. Northamptonshire Ae.C. Tea Party and Opening of New Club Buildings.
- Apr. 26. "Landing in Fog." Lecture by Dr. Rüd Stüssel before R.Ae.S.
- Apr. 27-May 6. International Aero Show, Geneva.
- May. Wilbur Wright Memorial Lecture, before R.Ae.S.
- May 17-June 2. Royal Tournament, Olympia.
- May 21. Guild of Air Pilots Garden Party.
- May 24. Empire Air Day.
- May 26. Heston Air Navigation Trials.
- May 27. Deutsch de la Meurthe Cup.
- June 1. Entries close at 12 noon for London-Melbourne Race.
- June 2. Brooklands Air Race Meeting.
- June 3. London Aeroplane Club Garden Party, Hatfield.
- June 9. Reading Ae.C. Annual "At Home."
- June 16. R.A.F. Reserve Flying Club Annual Flying Display, Hatfield.
- June 23. Lancashire Ae.C. Air Display, Woodford.
- June 30. Royal Air Force Display, Hendon.
- July 13-14. King's Cup Race. Start and finish at Hatfield.
- July 3-9. 4th International Congress for Applied Mechanics, Cambridge.
- July 7. Opening of Leicester Airport.
- July 21-22. French Grand Prix.
- July 28. Bristol and Wessex Ae.C. Garden Party.
- July 29. London-Sherburna Race (York County Aviation Club)

EDITORIAL COMMENT



PERHAPS it was just convenience, perhaps it was design, which prompted the Government to choose Lord Londonderry as their spokesman in the House of Lords on March 14 in opposing Lord Hutchison's proposal of a Ministry of Defence. It is a common outcry now that the air does not get its due share of the money allotted by Parliament for defence. The popular impression among readers of a certain class of newspaper is that the three Defence Ministries engage in a dog fight for the biggest bone when the Estimates are drawn up, and that the Royal Air Force, being the youngest Service, the "Cinderella," as some popular papers have it, is left mourning by the fire, while her two Ugly Sisters go off to the ball. If there were any truth in that picture, then one would suppose that the Air Minister would be the first to clamour for a Ministry of Defence, whom he might picture as a Fairy Godmother ready to provide gorgeous apparel, gilt coaches, glass slippers, and all the rest of it. Of course, each member of the Cabinet must be loyal to Cabinet policy, but it is one thing to acquiesce, and it is another to make a convincing speech in support of that policy. Consequently, when Lord Londonderry, in reply to Lord Hutchison, analysed the whole case for and against a single Ministry of Defence, and announced his conclusion that the idea was impracticable, one must accept it that the Air Minister was speaking from conviction.

Lord Londonderry started by admitting that he had once held views not dissimilar to those advanced by Lord Hutchison, but after close examination he had come to the conclusion that they were not practicable. He did not say that the scheme was bad radically. No one seems to deny that to have one Defence Minister ruling all three Services and co-ordinating their work in time of war would be the ideal. But in practice it would not work. Every one who has examined the subject with care seems to be agreed on that point. Lord Londonderry first treated the matter historically, and recounted the various attempts which have been made, abroad as well as at Home, in this direction, none of which

has been successful. He then examined what would be required of a Defence Minister in peace and found the situation unworkable. In war it would be much worse. No man, he said, could master all the details which such a Minister ought to know, or could find time for all the duties which now seem to be beyond the powers, or at least of the time, of three separate, industrious Ministers. Under-secretaries or deputies would not, he held, prove a solution, but might only further complicate the situation. "If war should occur," said Lord Londonderry, "the conduct of the war inevitably becomes the main policy of the Government." Therefore the Prime Minister is the man chiefly responsible for the defence of the country, and he becomes in effect the Minister superimposed over the three fighting Services. No other arrangement seems possible in our constitution. Lord Londonderry considered that the flexible working of the Committee of Imperial Defence was the expedient most suitable to this country.

One very interesting statement of Lord Londonderry deserves special emphasis. He said: "The idea so sedulously fostered in some quarters that the Defence Services are in a continual state of warfare, and struggling together for limited sums available for Defence, has no foundation in fact." He went on to describe the process by which the available funds are allotted to the three Services, and his words should be reassuring to many who have held the theory of rivalry. Of course those words do not imply that each interest does not push its own claims as earnestly as possible. That is a natural result of *esprit de corps*, and that spirit is rightly held to be one of the merits of fighting men. Even in each Service all are not unanimous. One cannot imagine the cavalry offering to surrender their share of the pelf to the Royal Tank Corps. But such natural desire to have the wherewithal to improve one's own Service or one's own arm, where obviously all are far below real fighting strength, is a very different thing from the intrigue which some believe to be rampant. Again the official explanation carries additional weight because it is voiced by the Minister whose Service is given the smallest grant.

Although it was a wise move to entrust the exposition of the Government's views to the Air Minister, it seems to us that it would be a still better thing if the Government were to make some official pronouncement on the reasons for the distribution of the money between the three Services. It might well be found that if the Committee of Imperial Defence were to lay down the ideal proportions of naval, military, and air strength, it would still be found that the Royal Air Force was the cheapest investment. Some such statement should do much to still the foolish remarks which are sometimes heard, to the effect that if all the money spent on the Royal Navy were to be given to the Royal Air Force, we should become invincible, or something like it. A Publicity Department in the Prime Minister's office seems to be needed, to explain the Government's policy. As Lord Bayford said the other day, "We have got a really good business Government, but what it lacks is a really good booster."

♦ ♦ ♦ ♦

For the most part our aircraft designers are very modest men, and are content so long as their aeroplanes fly well. There is one head of an aircraft

firm, however, who would probably feel insulted if he were accused of modesty. Since the days of the war, Handley Page has been a name well known to the man in the street, and so when Mr. F. Handley Page writes or speaks about war in the air, the man in the street usually believes what Mr. F. Handley Page says. So to hold the confidence of the public confers responsibility, and in a long article published in the *Observer* of March 18, Mr. Handley Page rises to that responsibility.

There are many popular fallacies about martial aircraft prevalent at the moment, and one constantly comes across quotations of these fallacies by the more ignorant type of M.P. in parliamentary debates. One of these fallacies is the easy convertibility of commercial aircraft into bombers. Time and again we see the statement cropping up that such-and-such a foreign Power has more large civil aircraft than we have, and that this must be reckoned as part of her ability to bomb London. So it might be, if all our defensive fighters, searchlights, etc., were abolished. But to compare civil aeroplanes, fitted with bomb racks and possibly with gun rings, manned by crews not trained to the work of bombing, and commanded by an officer without experience and practice in the tactics of bombing—to compare such amateurs with such an organisation as our Central Area or Western Area, is an unjustified attempt to make our flesh creep. Gen. Göring, the Prussian Prime Minister, recently scoffed at the idea of using civil machines as bombers, and gave technical reasons in support of his view, but his words were not likely to make much impression over here. Mr. Handley Page will carry much more weight.

Tracing the history of aeroplane development, he showed how for long the ideas which came from the war dominated design, and added that even to-day aeronautics are not far enough away from the war for most minds to distinguish civil aircraft from their military counterparts. So long as the two types differed but little so long would the air be the subject of national suspicion. Fortunately, however, powerful factors were at work which must inevitably cause a wide divergence between the two classes. Military design, influenced by supercharged engines, tends towards flying at great heights. Civil design, on the other hand, tends towards carrying larger pay-loads per power expended at less speed and at much lower altitudes. Stratosphere flying at 2,000 m.p.h. was not mentioned as a possibility by Mr. Handley Page. Mails, he said, were the only sphere of commercial activity for which great speed is essential. For mail carriage he advocated only post office contracts. For other commercial air transport he looked forward to the day when the economic qualities of aircraft such as he had indicated would make the operation profitable without subsidies.

The divergence of the civil and the military types of aircraft has for some time past been growing steadily more pronounced. When the process has gone a little further, *pari passu* with a development of air knowledge, the man in the street will come to recognise the great differences, as easily as he can now distinguish between a racing car and a tank. Ignorant M.P.'s may delay this by continuing to repeat the above-mentioned fallacy, but even M.P.'s must in time learn to recognise facts which every schoolboy will soon know.

AERIAL BRISTOL :

The city of Bristol has been associated with aircraft from the very early days. Here is an aerial view of Brandon Hill and the Clifton area, showing many buildings of historical, etc., interest — Cabot Tower, Queen Elizabeth's Hospital (city school), Bristol University, Bristol Grammar School, and the famous Queen's Road shopping district.

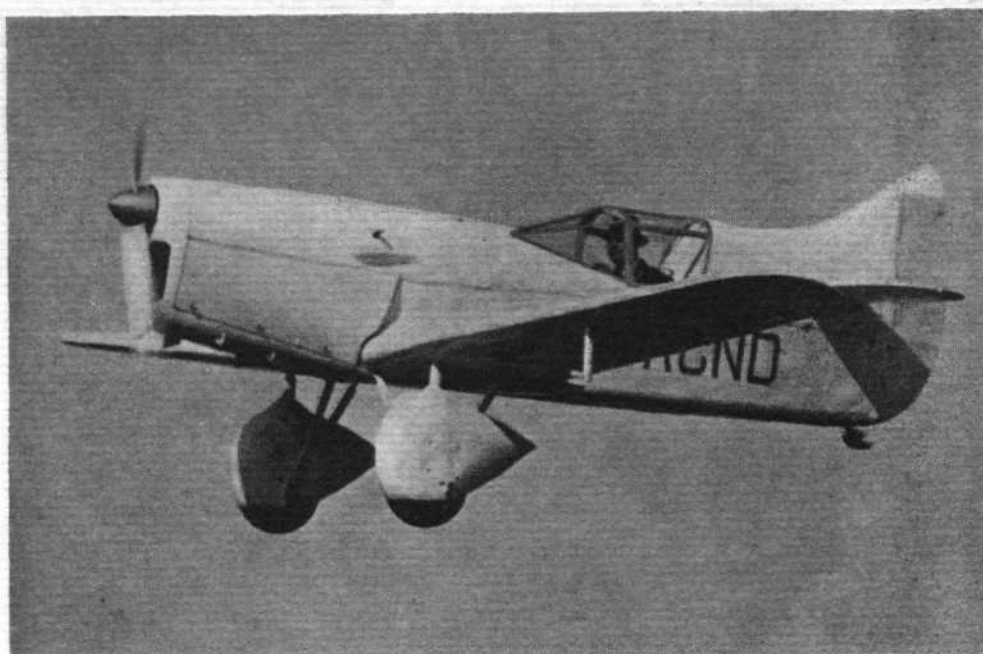


THE PERCIVAL "MEW GULL"

200 m.p.h. with Napier
"Javelin"

WHAT is probably the fastest British aeroplane of its size and power, the Percival "Mew Gull," was demonstrated for the first time at Gravesend aerodrome on Thursday of last week, when Mr. E. W. Percival flew his latest machine in a gale of wind before a number of press representatives who had travelled down to Gravesend in a coach placed at their disposal by Mr. Percival and the Napier company. On the way down the talk, not unnaturally, turned to the likelihood or otherwise of Mr. Percival flying the new machine in the high wind, gusty at that, which blew over Kent on that day. Doubts were soon allayed, however, when the party arrived at Gravesend, for no sooner had Mr. Percival greeted the visitors than he donned his parachute, got into the machine, taxied down wind without anyone hanging on to the wing tips, turned into wind, opened the throttle and was off. It was a display of *sang froid* which one has rarely seen equalled. The wind blew probably at 40 m.p.h. at least, gusting to 55-60 m.p.h. On Gravesend aerodrome one had some difficulty in making oneself understood owing to the wind. The strong wind helped the take-off and subsequently the landing, it is true, but the gusts gave Mr. Percival an opportunity to find out very early in the flight how the new machine responded to the controls. As far as could be seen, neither ailerons nor elevator need ever be used to their full extent, and ample reserve of control appeared to be available throughout.

After taking the machine "upstairs" to try it out at little in the slightly steadier air, Mr. Percival came down and flew across the aerodrome, first down-wind and then up-wind, for the benefit of the photographers. There was no doubt that she was fast. Exactly how fast was difficult to judge in that high wind. A tiny machine is always apt to look faster than it is, while a large machine often



200 M.P.H. : Mr. E. W. Percival demonstrated his latest machine, the "Mew Gull" (Napier "Javelin"), in a gale last week. These views of the machine indicate that in spite of the location of the cabin, the view diagonally forward is quite good. (FLIGHT Photos.)



FAST TOURING : A glimpse of the "Mew Gull" flying past, with its designer at the controls. (FLIGHT Photo.)

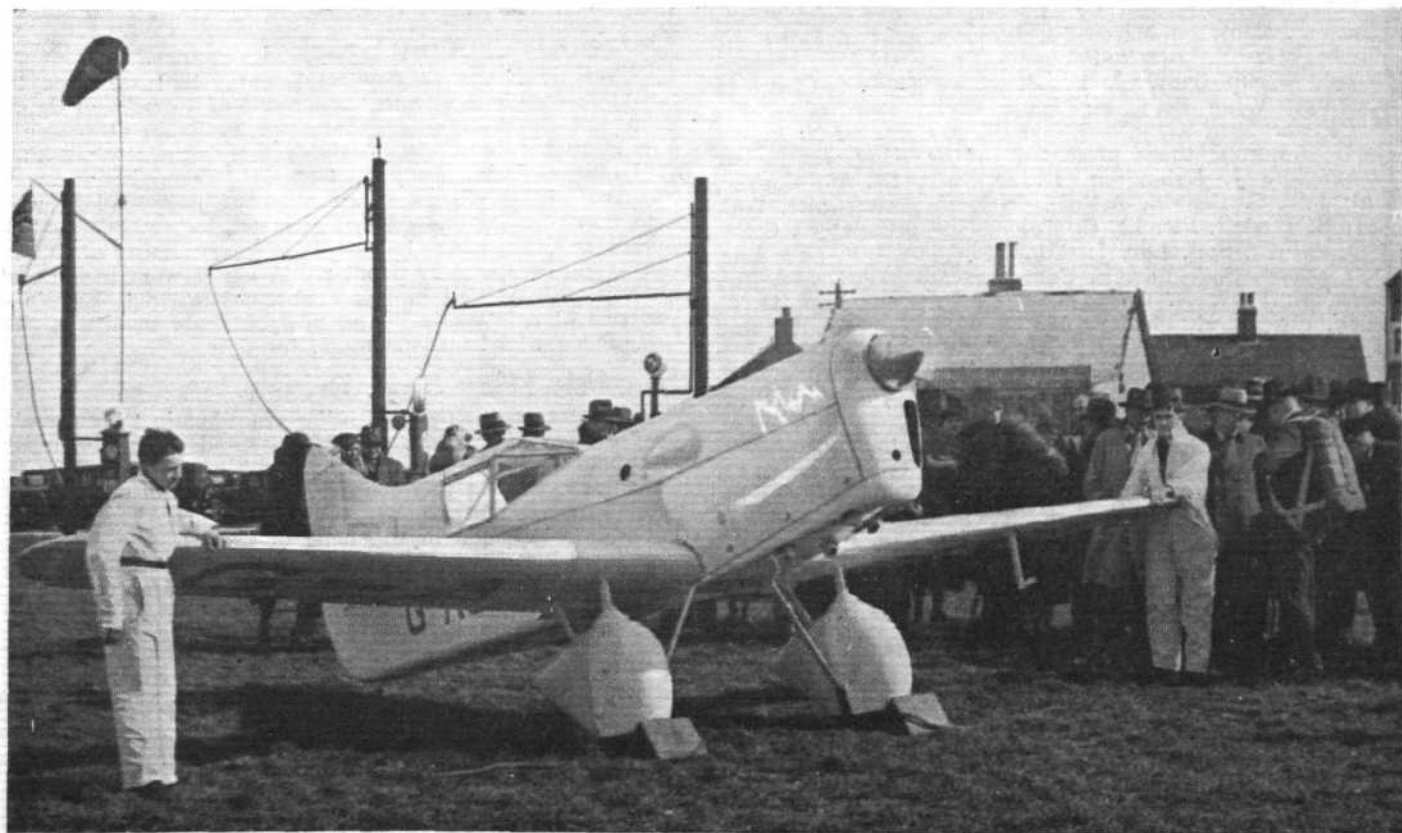
looks slower than it is. Bringing the machine in somewhat fast (quite wisely in that gusty wind) Mr. Percival made a very good landing, turned down-wind and taxied in, apparently not bothered by the gusts. The rather high wing loading helped, of course, and a lightly loaded machine would certainly have been blown on to a wing tip.

After the well-merited applause had died down, the party sought the shelter of the very comfortable club house at Gravesend, where refreshments were served. During these we were able to get a few details from Mr. Percival concerning his latest machine.

Designed by Mr. Percival himself, and built in his

experimental works at the Gravesend aerodrome, the "Mew Gull," as the new machine is called, is a low-wing cantilever monoplane of wood construction, fitted with a Napier "Javelin" engine of about 165 b.h.p. The machine is intended for the private owner who is a good enough pilot to fly it, and who wants to be able to make prolonged tours at high speed, for the carriage of press photographs from distant parts of Europe in a minimum of time, or possibly for carrying relatively small quantities of valuable and urgent mails.

In general design the "Percival" resembles somewhat the "Gull," with which Mr. Percival has had such con-



PREPARING FOR THE FIRST FLIGHT : Mr. Percival may be seen on the right, donning his parachute before taking the "Mew Gull" up in a gale. (FLIGHT Photo.)



ROOM ENOUGH: In spite of the small size of the machine, there is room in the cabin for a large pilot (in this case Mr. Percival himself) wearing his parachute. The luggage locker is in the tail fairing. (FLIGHT Photo.)

siderable success, but differs in being a single-seater, and in having the pilot's cabin placed very far back, in fact almost in the tail. In spite of this placing of the seat, the view is by no means bad. This is partly due to the use of an inverted, in-line engine, and partly to the fact that the cabin roof is raised a considerable distance above the decking in front of it. From a drag point of view, it is quite likely that the arrangement is good. The critical part of a streamline form seems to be that just aft of the maximum cross-section, as far as excrescences are concerned, and by moving the windscreen well aft, the cabin merges into the tail very neatly.

With a wing span of only 24 ft., a length of but 18 ft. 3 in., and a wing area of 78 sq. ft., the "Mew Gull" is a very small machine. Yet its cabin is by no means unduly cramped. In the deck fairing towards the tail is a luggage locker, which will take quite a large suit case; if the machine is used for touring, or a fairly bulky parcel of mails or press plates or photographs.

The petrol tank is in the fuselage, between the cabin

and the engine, and holds sufficient fuel for a flight of rather more than three hours. As the machine will probably cruise at about 175 m.p.h., the range is approximately 550 miles. The Napier "Javelin" engine has been used with success in several of the Percival "Gulls," and is the power plant chosen for the "Mew Gull." It drives a Fairey metal airscrew.

With a gross weight of 1,460 lb. and a wing area of only 78 sq. ft., the "Mew Gull" is naturally not a beginner's machine, but in the hands of a good pilot it should be capable of giving a good account of itself. One can, of course, be fairly certain of seeing several in the King's Cup Race. One would like to see it in the Coupe Deutsch, but the Napier engine is just a little over the 8 litres permitted, although by the use of liners the capacity of the "Javelin" might be brought down to the required capacity.

The tare weight of the machine is 996 lb., and the load consists of the following:—Petrol 227 lb.; oil 25 lb.; luggage 50 lb.; pilot 162 lb.

At St. James's Palace

At the Levée held by His Majesty the King at St. James's Palace, on March 13, those present included Air Marshal Sir R. Brooke-Popham (Principal Air Aide-de-Camp), Group Capt. T. E. B. Howe (Aide-de-Camp in Waiting), Wing Com. Sir Louis Greig, Marshal of the R.A.F. the Lord Trenchard, and Wing. Com. Sir N. Leslie, Bart. Amongst those presented to the King were:—Air Commodore J. Babington, D.S.O., Flt. Lt. R. Barlow, Sqd. Ldr. S. Benson, A.F.C., F/O. F. Braithwaite, Sqd. Ldr. E. Bussell, Flt. Lt. C. Cadell, Group Capt. W. Callaway, A.F.C., Sqd. Ldr. J. Chick, M.C., A.F.C., Sqd. Ldr. D. Clappen, Sqd. Ldr. S. Collett, A.A.F., F/O. W. Collingwood, F/O. R. Councell, P/O. P. Donkin, F/O. C. Dook, Flt. Lt. E. Fielden, A.F.C., Wing Com. A. Glenney, M.C., D.F.C., Sqd. Ldr. J. Green, Flt. Lt. H. Hamersley, M.C., Sqd. Ldr. R. Hanmer, M.C., Sqd. Ldr. S. Harris, D.F.C., A.F.C., Group Capt. T. Howe, A.F.C., A.D.C., Wing Com. the Rev. J. Jagoe, F/O. L. Jarman, F/O. R. Jonas, Flt. Lt. H. Mellor, Air Commodore H. Nicholl, C.B.E., Air Commodore V. Richardson, O.B.E., Flt. Lt. B. Russell, Group Capt. J. Sowrey, A.F.C., Flt. Lt. I. Statham, A.A.F., Wing Com. T. Studd, D.F.C., Wing Com. J. Summers, M.C., Flt. Lt. R. Sutherland, D.F.C., Flt. Lt. A. Thackray, Flt. Lt. E. Ward, Air Commodore W. Welsh, D.S.C., Wing Com. J. Woodhouse, D.S.O., M.C., etc.

Irish Free State estimates

THE Public Services Estimates of the Irish Free State for 1934 make provision for a "token vote" of £10 for assistance to civil aviation; this will permit a supplementary estimate being introduced during the year if required. The Free State's subscription to the International Commission for Aerial Navigation has been increased by £260 to £300 this year. No estimate of the total cost of the Army Air Corps is given, but the flying personnel (including pilots, observers, pupils and gunners) provided for is forty, as compared with thirty-five last year. There is a reduc-

tion from £12,766 to £7,795 for general stores for this branch of the defence forces.

Death of Captain Sparkes

It is with the very greatest regret that we have to record this week the death, as a result of a crash, of Capt. F. G. M. Sparkes. Details are not available at present, but it appears that Capt. Sparkes was flying a new machine at Lambert Field, London, Ontario, when the accident occurred. Capt. Sparkes, as most of our readers will remember, was at one time chief instructor to the London Aeroplane Club, where he taught a great number of pupils to fly, and became very popular. When he went to Canada he was sadly missed in this country, but Great Britain's loss was Canada's gain. And now both are mourning the loss of one who has done much for flying.

Swedish King buys British

A STRIKING "Buy British" gesture has just been made by the King of Sweden, who has granted a royal warrant of appointment to C. C. Wakefield & Co., Ltd., makers of Castrol oil, who in this country hold warrants of appointment both to H.M. the King and to H.R.H. the Prince of Wales. In addition to the King of Sweden, the company supplies Prince Gustav Adolf, the eldest son of the Swedish Crown Prince, and Prince Carl (Junr.), the King's nephew. These appointments are held to be an unusual tribute to a British product.

R.Ae.S. lectures

THE following additional lectures will be delivered before the Royal Aeronautical Society:—April 19, 1934: Air Commodore P. F. M. Fellowes, "The Houston-Mount Everest Expedition," at 6.30 p.m., in the Royal Society of Arts. May 31: Wilbur Wright Memorial Lecture by Prof. B. Melvill Jones, A.F.C., M.A., F.R.Ae.S., on "Stalling," in the Science Museum, South Kensington, by kind permission of the Director, Col. E. E. B. Mackintosh, D.S.O. (further details will be announced later).

From the Clubs

CINQUE PORTS FLYING CLUB

Flying hours for the week ending March 17 touched just over 30 hours, which included a certain amount of night flying. In spite of this, the weather has been too rough for first solos or "A" licence tests. Mr. J. G. Brown is joining the Club chiefly for the purpose of giving members lectures on general maintenance, theory of flight, instruments, meteorology and navigation. This has already aroused much interest in the Club, and the lectures will start immediately. They will be arranged to suit both week-enders and regular members. A new feature offered to members is a half-hour's dual at solo rates after every 5 hours' solo on the club aircraft. The advantages of this is obvious. Members are all too lax in spending the extra necessary for dual, when they can fly solo, and the result is that flying faults may develop and not be checked. From their point of view it will be welcome, and the standard of the club flying will benefit as a result. Arrangements for G-ABOG to be fitted with flares and blind-flying equipment are being made, so that the club can give all the necessary instruction without having to borrow G-ABAO from Brooklands. Arrangements for Mr. Bernard Rubin and Mr. Wallers' flight to Australia are now complete, and they hope to start in a day or two. Their schedule is to be back within six weeks. (We understand that this flight is by way of practice for the Melbourne Race next October.—Ed.)

BROOKLANDS

Stormy weather has been prevalent during the week ending March 16, most flying being confined to cross-country and advanced dual. Total hours for the week were 51, 23.40 dual and 26.20 solo. John Addinsell completed his "B" licence and Miss Fay, Mr. Murphy and Mr. Kaye did successful "A" licence tests. New members joined during the week were Mrs. Brandon and Lord Cardigan. Lord Cardigan, who has taken up flying again, showed that he has not lost his previous skill. A very welcome visitor has arrived at Brooklands in the person of Mr. Lew Taylor, who is recuperating from a very serious flying accident in New Zealand, where he was flying as passenger. All the members who knew him before he left Brooklands two years ago, and knew what he has gone through, are amazed at the marvellous progress he is making, and are looking forward to the time in the near future when he will again be flying with the untiring enthusiasm and energy by which he was always known. The Brooklands Cinema Club is becoming very popular; most of the present active members can now see themselves and their flying on the screen. These records are in progress of being arranged so that in the future any information can be produced, including the members' pictures. Members' photographs for their licences can now be taken at the aerodrome, so as to save the necessity of prospective "A" licence pilots having to find a suitable photographer, which usually results in licences being held up.

SOUTHEND FLYING CLUB

A gathering of members of the Southend Flying Club paid tribute to their former pilot and instructor, Capt. H. A. Love, and Mrs. Love, on November 10, at a dinner in their honour at the Palace Hotel, when more than fifty members and friends were present. Mr. S. S. Sylvester, one of the many pilots present who had learned to fly with Capt. Love, presided. During the evening, Mrs. D. S. Worke, on behalf of the gathering, presented Capt. Love with a handsome gold cigarette case suitably inscribed, together with a memorial signed by members of the Club as a memento of his service as club pilot and instructor. Capt. Love, who recently left the Club, has taken a similar position at Eastbourne, and flew over with the Club's former ground engineer, Mr. H. Flint, to attend the dinner.

Proposing the health of their guests, Mr. Donald Rankin, one of the keenest flying members, spoke in glowing terms of the services which Capt. Love had rendered to the Club, and of how his skill and ability as an airman and his genial personality had earned the respect and esteem of all members. Asking Capt. Love to accept the presentation, Mr. Garland, in the course of a humorous speech, suggested that they might have presented him with a portrait in oils or the original club "Bluebird" aeroplane, but Mrs.

Worke flew in at full throttle and landed the present suggestion, which they hoped would be acceptable. Mrs. Worke then graciously made the presentation.

Capt. Love, in reply, said he was very moved by the token of friendship he had received; he had always done his best for the members and he expressed his deep regret at leaving so many friends. The Chairman proposed the health of Mrs. Worke, who had so ably organised the function. He concluded by referring to the happy days they spent at Rochford Aerodrome while Capt. Love was there, and assured him that those he was leaving behind would keep the flag flying at Southend for aviation and good fellowship in his memory. A very enjoyable evening terminated with the singing of Auld Lang Syne.

READING AERO CLUB

At the annual general meeting of the Reading Aero Club, which took place at the clubhouse, Woodley, on March 11, the following were elected to the General Committee: Messrs. A. C. Sims, G. L. Harrison, W. L. James and Mrs. Battye.

The Hon. Secretary, Mr. C. A. Nepean Bishop, in his report of the year's work, mentioned that the year 1933 had been a good one, the flying hours of the Club and Phillips & Powis School of Flying members amounting to 1,862, an increase of 209 hours over the preceding year. He also remarked that the present year showed good promise of being still better, as the hours for the first eight weeks of the year were 218 against 99 for the same period of 1933. Club membership rose from 100 to 135, and there were as well a number of additional members from the Berks, Bucks and Oxon Club, which was incorporated with the Reading Aero Club towards the close of the year. The School had had pupils from 12 different nations during 1933. Mrs. A. L. Patterson had obtained her "B" licence and had gone still farther, also gaining an instructor's licence, being probably one of the first women pilots to get this licence. Mr. W. Slade obtained his "B" and instructor's licences, and Mrs. E. Battye was appointed personal pilot to Commandant Mary Allen, of the Women's Auxiliary Force. Mr. Ibrahim came from Egypt and obtained his "B" licence.

The annual "At Home" had been a success in spite of very bad weather, and the "Ladies Only" meeting was very successful. The tennis court was coming along well and would be in use about May, drought permitting. Mr. W. J. Barnes had very kindly presented the Club with a magnificent Challenge Cup to be competed for annually and to be won by "the most efficient flying member," that is, the member who gained the highest number of marks in a number of practical tests to be held during the period May-August inclusive.

Mr. Bishop concluded by expressing the gratitude of the Club to Mr. and Mrs. Powis for their untiring help and advice in the running of the Club, and coupled with this the names of Messrs. Lawn and Milne, who "hovered around like guardian angels watching over the destinies of their fledglings."

COVENTRY AVIATION GROUP

The Coventry Aviation Group had fine weather and perfect visibility for their flying on Saturday, March 10. As the aeroplane which the Group members will use this year is having a "top overhaul," it was decided to fly from the Leamington Airpark. After the Group's instructor, Maj. J. E. Bonniksen, had explained the controls, Mr. H. Butt took his first dual instruction and, incidentally, the first lesson given by a Coventry flying club. Messrs. E. Kemp, G. Peirson and H. Jackson also took their first instructional flights. The Leamington pupils put up very interesting performances. Mr. Parsons made his first solo flight with two excellent landings. The Messrs. and Mrs. Parry, who have just bought a "Gipsy Moth," proceeded to test its aerobatic abilities in no uncertain manner, and another pupil looped his first loop.

NORTHAMPTONSHIRE AERO CLUB

High winds again interfered with flying during the week ending March 18. On Saturday last three machines from the Club flew over to the Whaddon Chase Point to Point at Loughton. The Hon. Lady Bailey is to house her machine at the new Sywell Aerodrome. A local journalist is learning to fly at this Club, and will publish a

series of articles on each lesson as his tuition progresses. On a recent Sunday a formation of machines from the Club "bombed" an armoured car which was hiding in the neighbourhood. On the 16th, Messrs. Jack and Geoffrey Linnell carried out co-operation in the air with several contingents of O.T.C. who were engaged in "field-day" operations in the neighbourhood. The Northamptonshire Aero Club and the Northamptonshire Aviation Club hope shortly to be working in very close co-operation.

NORTH STAFFS AERO CLUB (N.F.S.)

The Club is holding its first annual dance on Friday, March 23 next, from 9 p.m. till 2 a.m., at the Crown Hotel, Stone, Staffs, when it is hoped to entertain a representative gathering from the district. A sincere welcome is assured to members of other clubs attending. Applications for tickets (price 10s. 6d. each) should be made to the Joint Secretaries, Meir Municipal Aerodrome, Stoke-on-Trent. The Club has been working under difficult conditions of late, having been without a resident instructor since June, 1933, but has been fortunate to obtaining, during last month, the services of Mr. R. G. Weighill, R.A.F.O., as honorary instructor. At present only one "Moth" is stationed at Meir, but flying time during the past four weeks has totalled over 14 hours.

MIDLAND AERO CLUB

During 1933 the total number of hours flown was over 1,400. This does not include the many hours flown by the fourteen private owners of the Club. Twenty-seven members obtained "A" licences during the year. Since 1929 the Club has been equipped with "Cirrus Moths" and they have done true and faithful service, and are still good for much more. One of the original machines, G-EBLT, has well over 2,000 hr. to its credit. However sad it is to lose old friends, it is necessary to keep up to date, and so the Club is now being equipped with three new 1934 "Gipsy Major Moths" and a "Puss Moth." In negotiating the sale of the "Moth Majors," Brian Lewis & Co., Ltd., the de Havilland distributors for Great Britain, have agreed to take in part exchange four of these veterans. The aggregate time flown by the four "Moths" is 7,730 hours or, expressed in distance, something over 620,000 miles. The club-house has several added amenities and many successful social events have gladdened the hearts of the members during the winter months. During the British Industries Fair the aerodrome was exceedingly busy and had many distinguished visitors, including H.R.H. the Prince of Wales, the Duchess of Bedford and Sir Kenneth Crossley. Lord Nuffield has recently become a flying member and the Wolsley aero engines in the three "Tom-Tits" are being put through their paces by Mr. George Lowdell and the instructors of the Midland Aero Club, Mr. W. R. Sutcliffe, Chief Instructor and Secretary, and Mr. J. B. Jurdon, late of the Central Flying School.

MARSHALL'S FLYING SCHOOL

Very strong winds and rain made flying impossible on several days last week. Flying times for the week were 11 hours dual and 4 hours solo. Dr. Rivers Moore made a first solo flight, and F. Rickaby, who recently obtained an "A" licence in India, joined the school, and G. Nicoll, another jockey, also had a trial lesson. Visitors were F/O. Sadler in a "Gull" and Mr. Colman in an Avro "Avian." Three cross-country and air taxi trips were made.

FROM HATFIELD

Messrs. Nothmann, Ross-Kirkman and Christiansen, of the London Aeroplane Club, completed the tests for their "A" licences and Mr. Meikle carried out his first solo, last week. The Club was beaten by the R.A.C. at squash on

Wednesday, March 14, by four matches to one, Mr. Burn being the winning member. The club machines put in 51 hr. 35 min. flying time. On Saturday, March 24, a "Pirates' Island" dance will take place. It is hoped that all members will attend dressed as if they had abandoned ship at a moment's notice. Lady Loch returned on March 16 in a "Moth" ("Gipsy II") from a three-weeks' flying tour to the south of France and Sicily.

HERTS AND ESSEX AEROPLANE CLUB

This Club was established in 1913, since which time 97 pilots have been trained. At present out of a total membership of 362 there are 175 flying members. During 1933, 2,500 flying hours were put up by the Club's fleet of five "Moths," three with "Cirrus II" engines and two with "Gipsy I" engines, and 46 pilots were trained. The club-house is being enlarged in order to provide room for lectures, entertainments, etc. A full sized billiard table has already been installed, and residential accommodation is provided for which the inclusive charge is £2 2s. per week. The Club possess a considerable number of Challenge Cups, and it has been decided to hold competitions once every two months. The member receiving the highest aggregate of marks in these competitions will be the Club's champion. The cups available for competition are the "Wrighton," presented by Mr. F. Wrighton; the "Shelmerdine," presented by Lt.-Col. F. C. Shelmerdine, the Director of Civil Aviation; the "Mollison," presented jointly by Mr. and Mrs. J. A. Mollison; the "Margaret Blackshaw," presented by Mr. J. Leslie Williams; the "Janet Lady Brickwood," presented by the Dowager Lady Brickwood; and the "Woodside," presented by Mr. William Sanders. The competitions arranged for these cups vary from pin pointing on cross-country flights to simple aerobatics, and full details can be obtained from the Club Secretary. The first competition of the season for the Wrighton Cup will be held on Sunday, March 25.

CARDIFF AEROPLANE CLUB

During the week ended March 18, Club machines flew 4 hr. 10 min. dual, 7 hr. 5 min. solo, and 35 min. on tests.

Sir John Cadman, G.C.M.G., has very kindly consented to become the Club's President.

Although the weather was too boisterous for any club flying on Sunday afternoon, Mr. Powis arrived down in a Miles "Hawk." Several members flew the machine and were very impressed, especially when taxiing on the ground, without anybody holding on to the wing tips, in a very strong gusty wind.

THE NORFOLK AND NORWICH AERO CLUB

There was a great improvement in the flying hours last week, helped considerably by cross-country flying. Messrs. A. Kirkby and A. R. Colman flew to Cambridge, and Messrs. H. C. Stringer and F. Dye took a machine to Broxbourne, and Mr. J. C. Smith and the Club's instructor visited Northampton. Soloists were Messrs. A. R. Colman, A. Kirkby, H. C. Stringer, J. C. Smith, W. O'Brien, A. J. S. Morris, S. Hansel and Miss W. F. Hudd. Great interest is maintained in the Public Schools Aviation Camp (see FLIGHT, March 15, 1934), which the Club proposes to run on the aerodrome next August, and the majority of the Club's mail consists of inquiries from parents and boys.

The Club will be holding a supper dance at the club-house at 8.30 p.m. on Friday, April 6. Wally Drane's "Follies" Band will be again engaged until 1 a.m. Tickets are 3s. 6d. each, and are obtainable from the Club Secretary. It greatly helps the organisation of these dances if members would order their tickets in advance.

A SUITABLE SIGN: Used as "a memorial to past achievement and an inspiration to further endeavour," the original "Tiger Moth" and holder of world records, is now to be seen attracting people to the site of the new D.H. factory at Hatfield. (FLIGHT Photo.)



THE SCOTTISH FLYING CLUB

At a meeting of the Scottish Flying Club, Ltd., held in Glasgow recently, it was stated that there was an increase in the establishment fund, during the year, of over £1,868. A report by the committee submitted by Mr. I. McWilliam, who presided, stated that the year had been one of marked development for the Club, and that the 119 new members had brought the total up to 544. The new club-house with its furnishings and fittings will cost approximately £3,000.

LIVERPOOL AND DISTRICT AERO CLUB

For the week ending March 16, 10 hours 10 minutes dual instruction was flown in the Club machines, and the Club's "A" pilots put in 14 hours 35 minutes between them solo. The exceptionally squally weather accounted for this comparatively small amount of flying.

AIR SERVICE TRAINING

During February, Capt. C. E. Larsen, the chief instructor of the Danish Air Force, successfully completed an instrument flying course. Mr. K. Lange arrived from Norway to qualify for the pilots' "A" licence and receive advance flying training preparatory to joining the Norwegian Air Force, showing the interest taken in Air Service Training methods by other countries.

Although fog was a severe handicap during the month 293 hours were flown, being twice the amount in February last year.

The number of pupils undergoing instruction is steadily increasing. New arrivals are: Mr. H. N. Olley taking the three years' long course; Messrs. D. G. S. Grant and J. E. Oates qualifying for the pilot's "A" licence; and F/O. A. F. C. Booth working for navigator's, wireless operator's and ground engineer's "A" and "C" licences. Mr. L. M. K. Williams, having obtained his pilot's "B" licence and wireless operator's licence at the school, returned for the navigator's licence. Flt. Lt. A. E. Røgenhagen is taking the instrument flying course and studying for the "B" licence technical subjects. Mr. B. Rubin commenced training in instrument flying and night flying and Messrs. E. Riddle and J. W. Truran, from the College of Aeronautical Engineering at Chelsea, are taking practical training in the maintenance of aircraft and engines.

During the month Messrs. V. M. Coles-Webb, H. MacDonald and W. M. R. Griffin obtained their "A" licences, and Mr. E. B. Nelson completed a seaplane course during which he flew the "Avian" seaplane and the "Cutty Sark" amphibian.

Mr. F. W. Hancock, who obtained his pilot's "B" licence, navigator's licence and wireless licence as a pupil at the school, has now received an appointment with the A.A. aviation department.

THE LONDON GLIDING CLUB—SOME RECORD FLIGHTS

On Saturday, March 17, the wind blew obliquely to the ridge at Dunstable from a south-westerly direction. There were limited patches in which up-currents were to be found and several soaring flights of short duration were made.

On Sunday, March 18, the wind had increased to about 25 m.p.h. and blew fairly up the hill. The conditions were somewhat boisterous. Both the "Prüfling" and the "Willow Wren" soared repeatedly along the ridge. During the day three members made very fine flights indeed. In the hands of Mr. P. A. Wills the "Professor" eventually covered a distance of 55 miles, during which he reached an altitude of 4,600 ft. Mr. G. E. Collins, with Herr Exner as passenger, piloted the "Kassel" two-seater for a distance of some 45 miles and reached an altitude of 3,700 ft., while Mr. S. Humphries covered over 20 miles in the "Crested Wren," a comparatively small sailplane but of a highly efficient design which was designed and built by Cpl. Manuel in 1931. Both Mr. Wills and Mr. Collins made full use of the up-currents by circling in them and on two occasions Mr. Wills was able to use the up-rising air connected with hail storms to gain considerable altitude. Mr. Wills landed after 2½ hours' flight at Latchingdon, near Burnham-on-Crouch, and Mr. Collins at a point about four miles north of Chelmsford. The "Crested Wren" in the hands of Mr. Humphries advanced up-wind about a mile in front of the ridge at Dunstable before turning down-wind and flying for a distance of some 12 miles, during which he reached an altitude of 1,900 ft. He kept on down-wind, finally landing 1½ miles north of Hertford. Both the first flights are probably unofficial British records.

JOHANNESBURG AERONAUTICAL ASSOCIATION

The high standard of flying at the Club was commented on by Major H. Daniels, of the South African Air Force, who, with Capt. P. Nel and S. S. Halse, was one of the judges in the annual club contest for the Short Trophy—a test of practical flying which embodies a take-off, four figure-of-eights in steep turns, quick recovery from a three-turn spin, and loops, with a forced landing from 1,500 ft., engine off, into a demarcated area 150 yards long. The winner was Mr. P. Hesselson, with Mr. Rex Hull and Mr. J. McAdam second and third respectively.

Flying time for the week ending February 25 totalled 125 hours 10 minutes. This enormous total for the Club is explained by the fact that the rescue machines which have returned from South West African floods with a cross-country time of 80 hours 15 minutes. There was a cross-country flight to Port Alfred and the Kowie (1,000 miles) by Mr. G. D. B. Williams. Dual occupied 5 hours 15 minutes, and two new pupils, Dr. König and Mr. Herman, have joined.

MORE MONEY FOR FLYING CLUBS

THE Government proposes to increase the overhead number of flying clubs able to obtain a subsidy.

This statement was made by Sir Philip Sassoon, Under-Secretary for Air, in the House of Commons on March 19, while the various Votes of the Air Estimates were being considered on report. This statement was made when Sir Philip replied to the debate on the Vote of £513,000 for Civil Aviation. The Under-Secretary said that he sympathised with all those hon. members who would like to see a larger expenditure on civil aviation, but £513,000 was not a bad advance on £300,000 when, after all, the need for economy did still exist. The Air Ministry were anxious to see civil aviation further developed. The subsidy to Imperial Airways was one-tenth of the corresponding American expenditure, one-quarter of the French and half of the German and Italian. Imperial Airways were now operating 14,000 miles—

Mr. Chorlton.—Very slowly.

Sir P. Sassoon said that he would not accept that. The company carried their passengers and mails safely and punctually. The United States alone operated a bigger mileage than the British Empire, whose services it was

proposed to develop. Since 1929 the route mileage had increased by 150 per cent., the actual miles flown on regular services by 100 per cent., the number of passengers carried by 90 per cent. and the mails carried by 70 per cent. While Imperial Airways had shown a modest profit Continental concerns had made losses, and now the Germans were copying our system of concentrating financial assistance on one strong operating company.

The Air Ministry were sufficiently satisfied with the progress of the Light Aeroplane Club movement to be decided on its extension. That movement had been a success. It was the only means that the man in the street had of being able to fly an aeroplane. It was a purely democratic movement. He could give no details of the extension except that it was contemplated increasing the overhead number of clubs now able to obtain the subsidy.

The Air Ministry were anxious that the light aeroplane club movement should not be in any way a military movement. They were building up a reserve of pilots in quite another way. They contemplated an extension of the reserve.

To clubs and schools

MR. W. H. E. THOMAS, of Grand Buildings, Trafalgar Square, London, W.C.2, is compiling a book which he is calling the Flying Club and Schools Year Book. Mr.

Thomas believes that he has written to all the existing clubs and schools in Great Britain, but asks that any which have not received a letter from him should send him particulars at once for inclusion in the new book.

Air Transport & Commerce

THE AIRPLANE DEVELOPMENT CORPORATION "V.I."

THE "V.I." is the first machine to be produced by the Airplane Development Corporation of Glendale, California. This Corporation is a subsidiary of the Cord Corporation, of Chicago, which, with Mr. E. L. Cord as President, operates the Stinson Aircraft Corporation, Lycoming Motors, the Auburn Automobile Co., and several other engineering firms. About two years ago, when the demand for very fast transport aircraft was first heard in the U.S.A., Mr. Cord secured the services of Mr. Gerard Vultee, who for several years was chief engineer of the Lockheed Aircraft Co. Designed and constructed at the Grand Central Air Terminal at Glendale, California, the machine made its first test flights about a year ago, and recently ten machines of similar type were ordered by American Airways.

The aircraft is an all-metal, single-engined, nine-seater, low-wing, cantilever monoplane, with retractable undercarriage. The wing, which is tapered both in plan form and thickness, is in three parts, the centre section, which is built integrally with the fuselage, and two outer sections which are bolted to the centre section. The structure of the wing is of the "shell" type, and is claimed to be very rigid in torsion. A smooth outer covering of Alclad sheet is attached to longitudinal corrugations which run the entire length of the wing. A removable panel on the under surface of the wing affords ready access to the interior for inspection and repair. Ailerons of high aspect ratio statically balanced about their hinge axis to eliminate flutter are fitted.

The fuselage of metal monocoque structure is oval, having no longitudinal bracing. Alclad sheet covering is used, composed of overlapping riveted panels. As the panels are relatively short in proportion to the total length in the fuselage, it is not necessary to "form" the sheeting. It is possible to remove one or more of the panels from the fuselage by drilling out the rivets. These panels may be flattened out, and, using the flattened panel as a template, a new piece of sheet may be cut out and drilled. This operation can be performed by any reasonably skilled metal worker, and requires no special jigs or apparatus. All tail surfaces are of "shell" construction, the monoplane cantilever tail plane and the fin being built into the fuselage. Instead of an adjustable fin, a flap on the trailing edge of the rudder is used for trimming purposes. Similar flaps are fitted to the elevators and are operated by means of a lever in the pilot's cockpit. The provision of these small

AIRPLANE DEVELOPMENT CORPORATION MODEL V.I. Wright "Cyclone F.2" (700 h.p.)

DIMENSIONS	ft. in.	m
Span	48 0	(14,63)
Length overall	35 6	(10,81)
Height overall	9 3	(2,82)
Root chord	11 0	(3,35)
Tip chord	5 0	(1,52)
Mean chord	8 0	(2,44)
Track	10 2	(3,1)
Airscrew diameter (three blade) ..	9 4	(2,84)
Dihedral (top of wing) ..	3 deg.	3 deg.

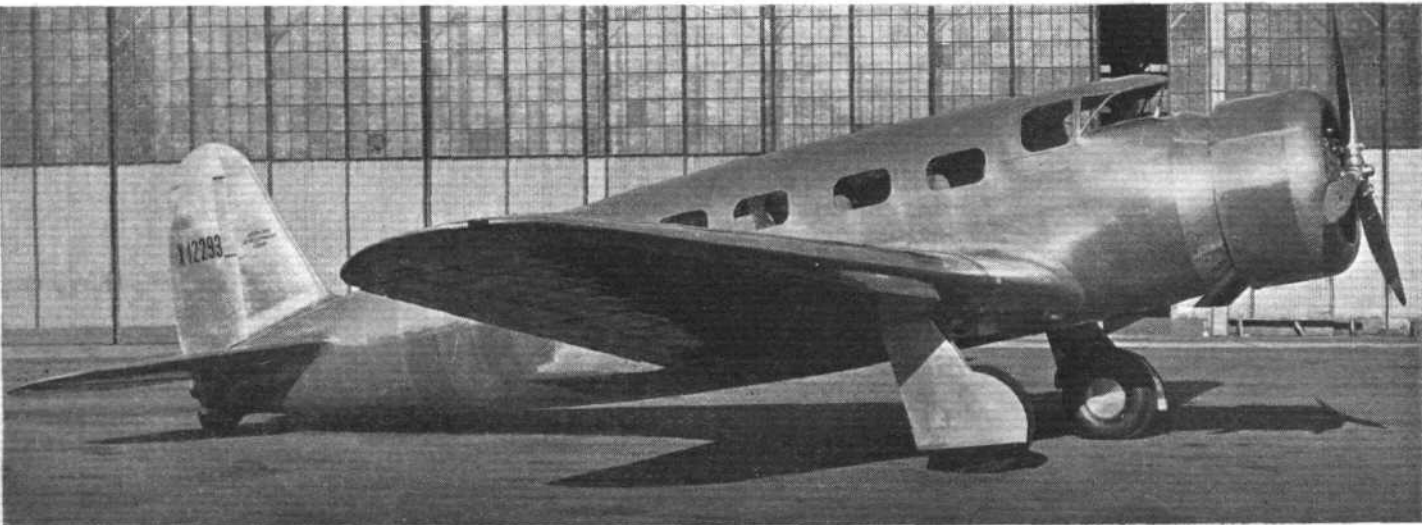
AREAS	sq. ft.	m ²
Wing area (including ailerons)	361.5	(33,58)
Ailerons	39.8	(3,70)
Tail plane	38.6	(3,59)
Elevator (including flap) ..	32.5	(3,02)
Fin	9.9	(0,92)
Rudder	14.1	(1,31)
Elevator flap	2.4	(0,22)

CAPACITIES	cu. ft.	m ³
Cabin	170	(4,81)
Mail compartment	20	(0,57)
Baggage compartment	30	(0,85)

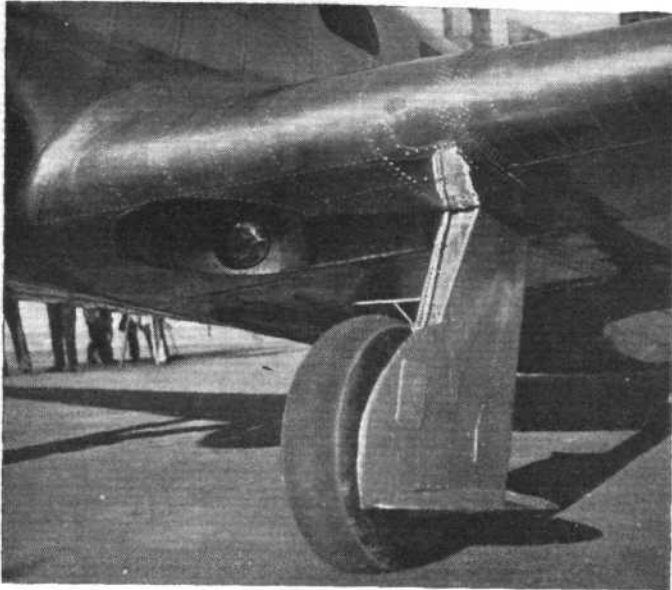
WEIGHTS	lb.	kg
Weight empty	4,275	(1939,11)
Fuel (148 U.S. gallons) ..	888	(402,79)
Oil	82	(37,20)
Pilot	170	(77,11)
Eight passengers	1,360	(616,89)
Baggage and mail	475	(215,46)
Total	7,250	(3288,56)

PERFORMANCE	m.p.h.	km/h.
Top speed	225	(362,10)
Cruising speed	195	(313,82)
Landing speed	65	(104,61)
Rate of climb at sea level ..	1,000 ft./min.	(5,08 m/sec.)
Absolute ceiling	25,000 ft.	(7620,0 m)
Service ceiling	22,000 ft.	(6705,6 m)

N.B.—The above figures are less two-way wireless and 3-minute flares, but with wireless mounting, brackets and controls. Add 170 lb. (77,11 kg) for wireless and 40 lb. (18,14 kg) for flares



FOR HIGH-SPEED TRANSPORT : The Airplane Development Corporation V-I three-quarter front view.

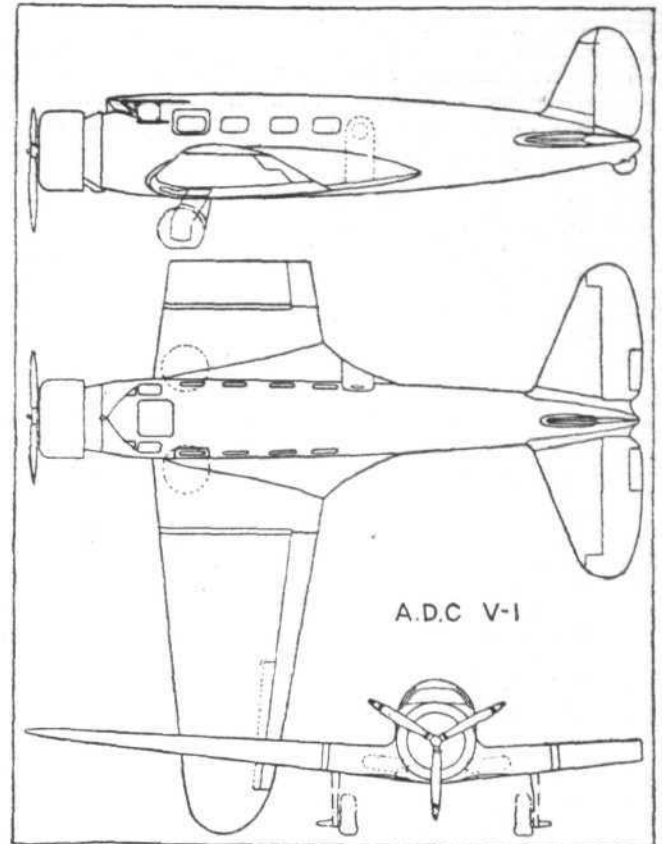


A MODERN UNDERCARRIAGE: One-half of the retractable undercarriage. The tail wheel also is retractable.

flaps eliminates the difficulty experienced in aircraft of this type in operating an adjustable tail plane at high speeds.

The retractable undercarriage is a novel type of construction. The gear is operated by rotary motion about a pivot, the interior operating mechanism being merely a worm drive. An electric motor drive is operated by the pilot by a switch, and this lowers the undercarriage in about seven seconds. Emergency manual control, suitable warning devices and a pointer in the cockpit indicating the position of the landing gear at all times, are provided. The gear itself is composed of a single cantilever duralumin strut of rectangular section, to the upper end of which is fastened a segment of a worm wheel. The lower end of this box-like strut contains an oleo shock absorber unit to which a stub axle is attached. To this strut is fastened an automatically operated fairing which completely closes the wheel well and renders the bottom surface of the wing perfectly flush when the gear is retracted. A single cable runs from a suitable point on the landing gear back through the fuselage to the tail wheel. This cable partially retracts the tail wheel, as the undercarriage itself is retracted.

A Wright "Cyclone" Model F.2 radial air-cooled engine, rated at 700 h.p. at 1,900 r.p.m., is mounted in the nose and enclosed in an N.A.C.A. cowl. A three-blade adjustable pitch metal airscrew is fitted. Fuel tankage for



A.D.C. V-1

a range of 800 miles (1287.5 km), 123.2 gall. (560 litres), is provided in the centre section.

The pilot's compartment is immediately behind the engine, aft of the fireproof bulkhead, and is fitted with a Vee-type inward sloping windscreen. The pilot sits on the port side and a mail compartment of 20 cu. ft. (0.57 m³) capacity occupies the starboard side of the cockpit. A soundproof bulkhead fitted with a small door separates the pilot from the passenger compartment. The eight passengers are seated two abreast, separated by a 12 in. (304.8 mm) aisle and the cabin seats are adjustable to three positions. The fuselage is 62 in. (1574.8 mm) high and 52 in. (1320.8 mm) wide. Behind the last seat is the main cabin door, and opposite this door is a fully equipped lavatory. Immediately behind the lavatory is the passengers' baggage compartment, and to the rear of this is the main radio installation. Standard equipment of the aircraft includes full night-flying instruments and flares, and complete two-way wireless.

JERSEY AIRWAYS

ON Monday, March 12, the incoming service from Jersey was duplicated, and 17 passengers in all were carried on the Jersey route that day. The company are expecting delivery of another "Dragon," bringing their fleet up to five. Two services a day will be run during Easter Week.

The time-table is as follows:—

	Heston (dep.).	Jersey (dep.).
Thursday, March 29	7.15 a.m.	9.15 a.m.
Friday, March 30	11.30 a.m.	2.15 p.m.
Saturday, March 31	7.45 a.m.	9.45 a.m.
Sunday, April 1	12.00 noon.	2.45 p.m.
Monday, April 2	8.00 a.m.	10.15 a.m.
	12.30 p.m.	3.30 p.m.
Tuesday, April 3	8.30 a.m.	10.45 a.m.
	1.00 p.m.	3.45 p.m.
Wednesday, April 4	9.00 a.m.	11.15 a.m.
	1.30 p.m.	4.00 p.m.

B.A.N.C.O. SERVICES

B.A.N.C.O. will run a special service to the Grand National on Friday, March 23, leaving Grosvenor House at 9.30 a.m. and Heston at 10.15. The return fare of £8 8s. includes luncheon in the air and admission to the reserved carriage enclosure. Regular services to Le Touquet will be operated by this company during Easter Week, at a return fare of £5 5s., leaving Heston as follows:— Thursday, March 29, 11 a.m., 3 p.m., 6 p.m.; Friday, March 30, 11 a.m.; Saturday, March 31, 3 p.m.; Sunday, April 1, 11 a.m. Return services will leave Berck for Heston on Sunday, Monday and Tuesday. Both the above services will be operated by a wireless-equipped three-

engined Ford, and in the latter case light refreshments will be served *en route*. The flying time Heston-Berck will be 45 minutes.

HIGHLAND AVIATION

ON March 8 the first passenger flight from Inverness to Stornoway and back was made. The machine used was a D.H. "Dragon" (two "Gipsy Majors") flown by Capt. E. E. Fresson, of Highland Airways. Starting from Inverness Aerodrome at 10.35 a.m., Stornoway was reached at 11.40 a.m., flying by Loch Broom. On the return trip the "Dragon" left Stornoway at 1.56 p.m. and flew back by way of Loch Maree as Capt. Fresson wished to make a survey in order to ascertain the possibilities of flying through Glen Docherty Pass and Achnasheen. Inverness was reached at 2.55 p.m. In the opinion of Capt. Fresson, the Glen Docherty route, except for four miles, is ideal for a seaplane service to Stornoway as there are excellent facilities for landing. For land machines, however, the obvious route is by Braemore and Ullapool. During bad weather it would be possible to fly at a low altitude. It is reported that the postal service to the Orkney Islands will this summer probably be carried by air. There is an air service between the islands and Inverness, and it is the proposal of the G.P.O. authorities to utilise this for mails. This would be the first internal air mail service in Great Britain.

TRANS-CANADA AIR MAIL

WE understand that there is a distinct possibility of the Trans-Canada air mail service starting next autumn. There has already been a great deal of work done in developing landing grounds by the use of preparations in

connection with "unemployed" assistance schemes, and by this means a more rapid advance had been made than would have otherwise been possible. We gather that the proposal is to commence operating a small section at the start and eventually to develop gradually until, by the end of about three years, the service will extend right across Canada from Halifax or the Straits of Belle Isle to Vancouver.

COMMERCIAL FLYING IN CANADA, 1933

ACCORDING to the *Financial Post* (Toronto) aeroplanes operated by Canadian Airways, Ltd., last year on mail services flew a total of 2,128 hours as against 3,370 hours in 1932 and 12,447 in 1931. In other than mail services the company's aeroplanes flew 9,489 productive hours last year as compared with 8,548 hours in 1932 and 4,659 hours in 1931. The total mileage flown in mail services dropped from 1,336,107 miles in 1931 to 210,666 miles in 1933, whilst in other services there was an increase during the period from 496,687 miles to 954,769 miles. Goods and mail transport last year amounted to 2,850,852 lb. as compared with 2,169,202 lb. in 1932 and 1,223,908 lb. in 1931. The number of lb.-miles increased during the same periods from 173,895,707 in 1931 to 344,704,550 last year. Passengers carried last year numbered 16,942 covering 1,094,600 passenger miles, as compared with 8,963 passengers covering 998,619 passenger miles in 1932, and 8,047 covering 111,628 passenger miles in 1931. Despite the curtailment of air mail services by the Government during the past two years, there was an actual increase of 10 per cent. last year in the volume of mail carried, and of 35 per cent. in the volume of freight and express. As compared with 1931, however, there was a decrease of mail carried of 28 per cent. and an increase of 230 per cent. in freight and express. Twenty air mail routes were in existence throughout Canada during 1933, 11 of these being established on a twelve-month basis. In January, 1934, the Fort Resolution-Great Bear Lake line was extended to Coppermine on the Arctic Ocean.

SOUTH AFRICAN AIR TRAFFIC

We have been supplied with the following traffic figures for the year 1933 for the Rand Airport, Germiston, which we think may be of interest:—

	Aircraft	Passengers	Freight lb.	Mails lb.
In	1,471	1,983	20,385	27,458
Out	1,468	2,074	29,216	25,875
Total	2,939	4,057	49,601	53,333
1932	1,547	1,594	24,103	22,395
Increase	1,392 (90%)	2,463 (154.5%)	25,498 (105.8%)	30,938 (135.8%)

N.B.—Local passengers not included in returns.

BRITISH AMPHIBIANS FOR YUGOSLAVIA?

THE air service between Bratislava, the capital of Slovakia, and the port of Susak in Yugoslavia, which was inaugurated last year, proved very successful, but owing to the frequent fogs and other unfavourable weather conditions at Susak Aerodrome it is proposed for this year to employ amphibian planes so as to enable landings and starts to be made at sea off the port. This would also have the advantage of enabling the service to be prolonged to the port of Split (Spalato). As this class of aeroplane is not constructed either in Czechoslovakia or Yugoslavia, it is likely that two machines will be purchased in England for this service.

A NEW INDIAN SERVICE

A REPORT from Delhi states that Indian National Airways, Ltd., expect to begin a weekly air mail service between Lahore and Karachi, with stops at Jacobabad and Multan, during September or October. A connection will be made with the British air mail service.

THE GERMAN SOUTH ATLANTIC SERVICE

DEUTSCHE LUFT HANSA completed, on March 13, the third twice-monthly transatlantic air mail service between Europe and South America. Six flights have been made in both directions, and all have been accomplished within five days.

PROPOSED WEST AFRICAN AIR SERVICE

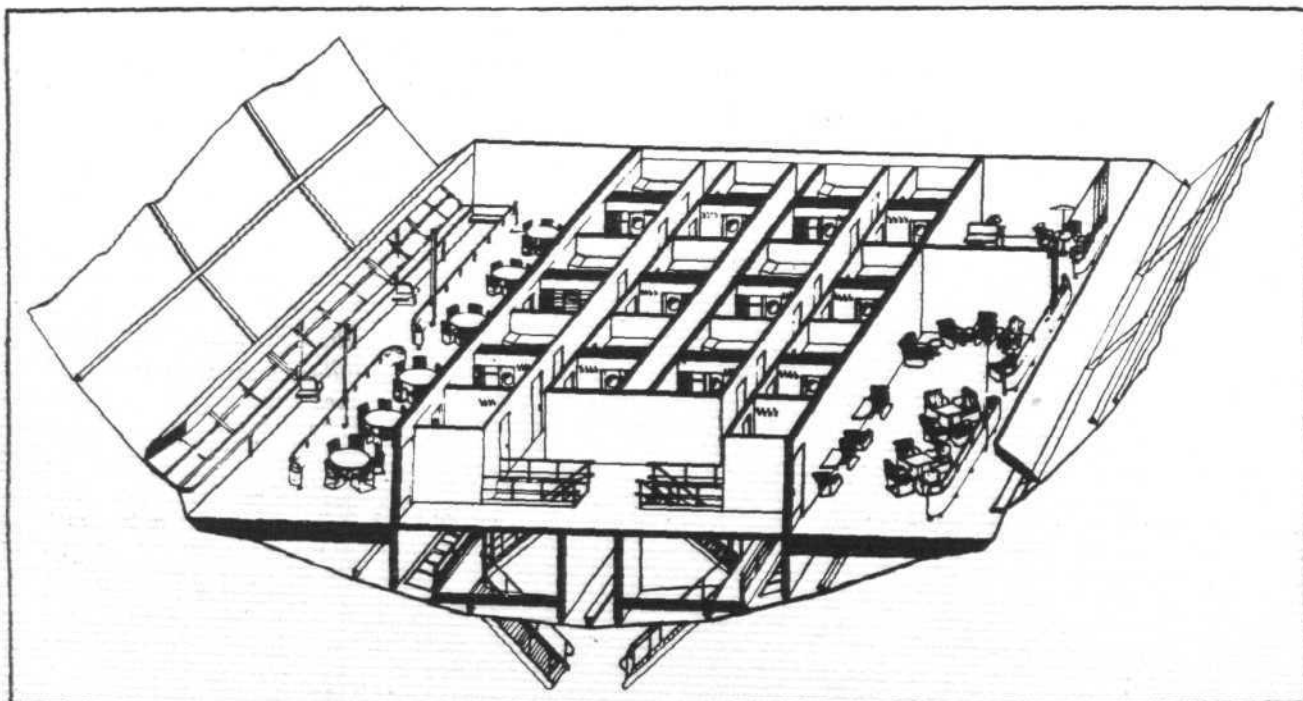
"TIN," the bulletin of the Anglo-Oriental Mining Corporation, states that a scheme is on foot to establish air services in Nigeria, the Gold Coast and Sierra Leone to connect with the Imperial Airways Cape-Cairo service and the French "trans-Saharienne" service to Europe. Preliminary air surveys show that services are possible throughout Nigeria, and Kano is suggested as the principal airport. Contact can be made from that centre with the various mines, particularly those on the Bauchi Plateau. It is understood that arrangements may be made with the French Government for aircraft to pass over French territory to connect with the Gold Coast sections. The Sierra Leone service would be developed later, a connection being made with Dakar about 400 miles up the coast.

K.L.M. AMSTERDAM-CHERBOURG SERVICE

ON March 9 the K.L.M. company inaugurated an air mail service between Cherbourg and Amsterdam, connecting with North Atlantic shipping services. Mr. Anthony Fokker, who arrived from New York on the same day, flew to Amsterdam in the first machine.

DEUTSCHE LUFT HANSA IN 1933

WITH reference to our paragraph relating to the above in last week's issue, we are informed that the exact figures for the mileage covered during 1933 and 1932 are 6,145,944 miles and 5,122,400 miles respectively—an increase of 15.5 per cent.



THE NEW ZEPPELIN: Sketch of the cabin arrangement of the L.Z.129, now under construction at Friedrichshafen.



THE FIAT C.R.30: The machine illustrated is the two-seater version which won the Bibesco Cup last year. Except for the cockpit arrangements the single-seater is similar.

SOME RECENT ITALIAN FIGHTERS

SEVERAL very interesting Italian fighting aircraft have been developed during the past year for the re-equipment of the Italian Regia Aeronautica. The Fiat firm in particular has been very busy, and the Fiat C.R.30 single-seater fighter (or "Aeroplano da Caccia") has been ordered in large quantities. The type has been further developed into the types C.R.32 and C.R.40. Both are similar in general design to the prototype, but the C.R.32 has an adjustable-pitch airscrew and other refinements, and the C.R.40 has an air-cooled engine in place of the 600-h.p. Fiat water-cooled engine in the C.R.30. Details of these two types, unfortunately, are not available. The C.R.30 was converted into a two-seater, and in this form won the Bibesco Military Trophy with a speed of 189.9 m.p.h. over a distance of 715 miles.

The Fiat C.R.30 machine is an all-metal single-seater fighter biplane with several interesting features. Perhaps the most notable, to English eyes, is the Warren truss interplane bracing. The top plane is in two sections and is larger than the lower plane in both span and chord. Drawn duralumin tubes of rectangular section are used for the wing spars, the walls of which are lightened with triangular holes.

The lattice ribs are of square-section duralumin tubes; duralumin is also used for the aileron framework, which consists of two spars with lattice ribs of square tube.

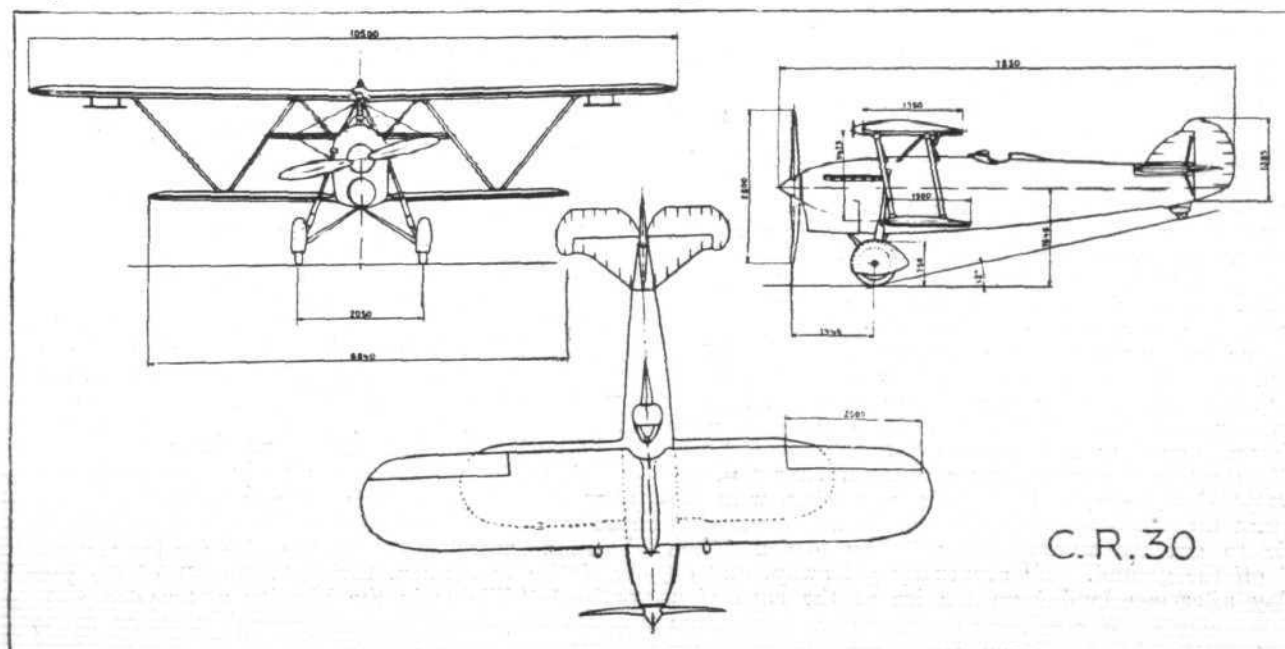
The fuselage is a rectangular structure with four longerons of round duralumin tubes connected by a system of triangles, also of duralumin tubes. The fuselage and

General Specifications of Fiat C.R.30 Fighter

Wing span	34 ft. 5 in.
Length	22 ft.
Height	9 ft.
Upper wing chord	5 ft. 9 in.
Lower wing chord	4 ft. 10 in.
Wing area	290 sq. ft.
Weight, empty	2,792 lb.
Disposable load	1,269 lb.
Wing loading	16½ lb.
Power loading (constant up to 8,528 ft.)	6 lb. 2½ oz.
Engine performance: 600 h.p. at 2,600 revolutions, constant up to 8,528 ft.	
Safety factor	14

FLIGHT CHARACTERISTICS

Speed at sea level	202 m.p.h.
" 9,840 ft.	223.7 "
" 16,400 ft.	217.5 "
Minimum speed at 1,640 ft.	65.2 "
Climb with disposable load of 1,269 lb.	
Climb to 3,280 ft.	1 min. 15 sec.
" 7,650 ft.	2 " 40 "
" 9,840 ft.	4 " 30 "
" 13,120 ft.	6 " 40 "
" 16,400 ft.	9 " 10 "
" 19,680 ft.	12 " 30 "
Take-off run	656 ft.
Landing	820 ft.
Flying range	2 hr. 30 min.
Theoretical ceiling	31,160 ft.
Service ceiling	29,520 ft.



spar joints are machined from solid steel. The secondary structure is made entirely from duralumin and consists of a set of "U"-section stringers kept in place by means of false bulkheads, or fuselage panels, made from bent metal sheeting suitably lightened. Fabric and duralumin sheeting are used for the covering. The fabric-covered tail surfaces are of duralumin with lattice ribs of square-section tubes. Both rudder and elevator are aerodynamically balanced, and the joints and hinges are fitted with ball bearings. The split-axle type undercarriage is of steel tubes with the upper ends of the oleo legs attached to the top longerons. Hydraulic wheel brakes are fitted to the wheels, which are enclosed in streamline fairings. A tail wheel with a special centralising device is used.

A Fiat A.30R water-cooled engine is fitted. The normal output of this engine is given as 600 b.h.p. at 2,600 r.p.m., but actually it can develop a maximum power of 850 b.h.p. at 2,900 r.p.m. A compression ratio of 8 to 1 is employed, and the reduction gear ratio is .611 to 1. According to the manufacturers, the dry weight of the engine (without airscrew hub, fuel pump and starting apparatus) is 959 lb. A water radiator fitted with controllable shutters is located under the engine with the cooling opening close behind the airscrew immediately under the boss. An Eclipse starter is usually fitted. There are two petrol tanks; a main tank in

the fuselage which may be dropped during flight, and a gravity tank in the top plane. The total petrol capacity of these two tanks is 82 gallons. A seven-gallon oil tank is located near the reduction gears and an oil cooler made from rectangular tubes acts as a cowl to the water radiator.

The armament is interesting in that it consists of two synchronised Vickers guns of 0.5 calibre instead of the more usual rifle calibre. The guns are independently controlled and are located in the top cowling, where their breeches are accessible to the pilot. A camera gun may be fitted on the starboard plane near the fuselage. An item of equipment unusual in single-seater fighters is an O.M.I. camera using 5 in. x 7 in. films with an automatic exposure setting. Thus the machine may be used for high-speed reconnaissance missions.

The pilot's cockpit is built in such a manner to allow a Salvator parachute, which is fixed to the pilot's shoulders like a knapsack, to act as a padding for the cockpit. A silk cable fixed to the fuselage by means of a snap hook opens the parachute automatically. The pilot may also open the parachute after he has jumped. Other equipment includes oxygen apparatus, a "Knock-Out" type fire extinguisher and electrical lighting and heating equipment.

At the International Meeting at Zurich in 1932, the C.R.30 won the Dal Molin Trophy.



THE OWNERSHIP OF CIVIL AIRCRAFT

FREQUENTLY we receive in this office requests for information regarding the ownership of civilian aircraft. The following data (correct to March 20, 1934), which we publish through the courtesy of the Joint Aviation Advisory Committee of Lloyd's Register and the British Corporation Register, should be of great interest to those who like to keep in touch with the progress of civil aviation in this country.

	Total.	Foreign.
Privately owned (men)	430	22
Privately owned (women)	47	5
Agents	47	3
Constructors	108	0
Clubs	78	0
Others (non-classified)	4	1
Business (other than aviation)	37	2
Aerial work	4	0
Taxis, schools and joyriding	264	5
Imperial Airways, Ltd.	37	0
National Flying Services, Ltd.	17	0
Total	1,073	38

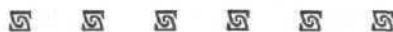
The heading "Foreign" implies that the machines are foreign-built aircraft registered in this country. They are included in the total.

With regard to this table it should be noted that, although it is stated that the aircraft constructors have 108 aircraft, it is estimated that about 50 of these are either demonstration machines or machines which have been

finished but have not yet been sold. Also, about 30 of this number should really be included under the heading "Taxis, schools and joyriding," for, although they have been registered in the names of firms as the de Havilland Aircraft Co., Ltd., the Bristol Aeroplane Co., Ltd., and A. V. Roe & Co., Ltd., they are used for school purposes, in many cases for the training of officers on the R.A.F. Reserve. It is probable that about 20 are either unfinished machines or machines for which application for registration has been made before the machine was built. Probably some of these will never be built.

Aircraft held by agents are divided mainly between Henlys (1928), Ltd., Phillips & Powis Aircraft (Reading), Ltd., Brian Lewis & Co., Ltd., and Brooklands Aviation, Ltd. Most of them will be, or have been, privately owned, although a few will probably be used for taxi work. The machines under the heading "Others (non-classified)" belong to the Air Council and to liquidators. "Aerial work" machines include the aircraft belonging to the Mount Everest Expedition and machines used for aerial photography.

It is difficult to classify accurately the machines under the heading "Business (other than aviation)." They belong to such concerns as the big oil companies, the British Red Cross Society, Dunlop Rubber Co., Ltd., Parker Duofold Pen Co., Maj. J. C. Savage, Skywriting and Standard Telephones & Cables, Ltd.



News from Canada

MR. LEE MURRAY, who is now in charge of the de Havilland Aircraft interests in Canada, writes to tell us of some of the difficulties in connection with the establishment of air services in Canada. He says:—

"There will be very considerable operating difficulties to be overcome, particularly in regard to undercarriages. As an example of the sort of things that happen, I can cite my own case. I have just returned from a comparatively short trip away from here, leaving last Wednesday night on skis with lots of snow and a temperature down near zero. Wednesday afternoon and early Thursday were excellent, low temperature and good visibility. About lunch time on Thursday we ran into a snowstorm and had to land. Forced landing on skis is really considerably easier than with any other type of undercarriage, because any lake or field with sufficient covering of snow is good enough and one does not have to bother about ditches, etc. By the time the snowstorm cleared on Thursday, the temperature had risen to slightly above freezing, with the result that the snow was so sticky that it was almost impossible to get the comparatively lightly loaded 'Puss Moth' off the ground. We eventually got away, and on Thursday afternoon landed on the ice at the edge of a river. We stayed there for two days, during which time it thawed, and when we left we had to exercise some care

to avoid the weak patches of ice. We ran into a lot of low clouds, rain and fog, and had to force-land halfway home, but this time on practically bare ground. Fortunately, the 'Puss Moth' is very heavy in the tail and did not nose over. The following morning we dragged the machine to a small patch of mixed ice, slush and snow and finally got off. From there onwards we had nothing except bare fields underneath us, and when we arrived at Toronto we were forced to land in a ploughed field, with a nasty squelching noise. This was all right as a landing went, but it was, of course, quite impossible to think of taking off. We pulled the machine out of this field on to some grass and changed back to wheels, and so flew back to the aerodrome. All this in a space of about four days, so you can see that a fast air mail schedule is not a tremendously easy proposition."

Lympne airport landing fees

A LANDING fee will not be charged in respect of an aircraft which necessarily lands at Lympne Airport for the sole purpose of enabling the pilot to communicate with the Croydon Control in compliance with the instructions issued in Notice to Airmen, Series A, No. 81 of the year 1933, entitled "Flights in the Vicinity of Croydon and on the London-Continent Airway during conditions of bad visibility."

FLYING EXPERIENCES IN INDIA

Extracts from a paper read by Mr. N. Vincent (Manager, Aviation Dept., Tata Sons, Ltd.) at the Rotary Club, Bombay

IN December last, Mr. N. Vincent read an interesting and amusing Paper before the Bombay Rotary Club, extracts of which we give below:—

"I am to speak on my flying experiences and on the development of aviation in India. After leaving the Royal Air Force I agreed to join the Air Survey Company in Borneo. Having done so I returned home and looked up Borneo in the Encyclopedia, from which I gathered that if I escaped the crocodiles and pythons, I would die of any one of the several diseases offered. Like most countries, however, it proved quite pleasant when I arrived. I had the good fortune to work there under Mr. F. P. Raynham, a man whose name was as well known in flying before the war as any of the present-day record breakers. My only anxiety was that although in London my employers had foolishly gathered from my light talk that I had some experience in flying seaplanes, I had, in fact, never even seen one.

"The morning after my arrival Raynham suggested that I fly round and have a look at the country. Not daring to confess I asked for a short passenger flight first. I realised of course that the only difficulty would be in the take off and landing. Once in the air a seaplane handles like any other aeroplane. By leaning forward from the back seat I noticed that Raynham did not touch the stick until the machine was lifting on to the step of the float, he merely kept straight by ruddering. Once on the step we were soon in the air. Landing seemed much simpler than I feared, especially as we were using a river and one was able to watch the bank instead of the water. In practice I found seaplanes delightful to fly and much prefer them to land aeroplanes. Our company was engaged in making photographic maps of the Rajang Delta. We flew up and down taking vertical photographs which overlapped each other in every direction. When printed the photographs formed a complete photographic mosaic of the country surveyed. This is a rough description of a branch of flying which has a tremendous future. It is surprising that so little use has been made of it, especially in mapping areas of undeveloped land. Nowadays air survey can compete in accuracy with ground survey. It is far cheaper and can often complete a map in a few months which would take years to produce by other methods.

"Borneo is the home of head hunters and orang-utangs. Of the place where we were based, Sibul, it is true to say that it is a topping little place with a river at the bottom of the garden. When it rains the garden is at the bottom of the river. It was here that I had my first experience of going out to dinner in a canoe. The paths were raised, but sometimes they were covered with water, and guests would splash along in rubber boots, being guided by a lamp placed on the verandah in line with the path. It was possible to place the lamp in the wrong position and lure people off the path into deeper waters. This was a recognised amusement.

"When our work was complete in Borneo we flew across to Singapore via Pontianak in Dutch West Borneo, and the Islands of Tandjong Padang and Billiton, carrying with us the first air mail between Borneo and the Strait Settlements. . . .

"From Singapore we flew to Port Swettenham in the Federated Malay States to make a survey of the forest areas on the west coast, again carrying a first air mail. Forest officers were flown over areas already photographed until they could recognise the various types of trees from the photographs. Once they had learned to do this it was possible for them to make stock maps from the photographic mosaics. This is a more comfortable method than ploughing about for months knee-deep in mangrove swamps.

"About this time our machine was beginning to show signs of weariness. It refused to be coaxed off the water on calm days with a full load until we discovered that by taxiing along the edge of the banks so that the floats ran on the mud we could get up a good speed and then swerve into the river fast enough to remain on the step and so get into the air. Luckily we never hit a submerged or rotting tree trunk.

From the Malay States we flew to Rangoon via Siam. This proved to be a most adventurous flight, as the old seaplane could hardly get off the water. I had to leave

my engineer at Victoria Point to save weight and go on alone. The weather was really terrible, as those who know that coast in the monsoon will realise. We spent two days on an island off the Kopah Inlet in the company of some wood-cutters waiting for the storms to ease off. After several minor mechanical troubles my crankcase broke over the Gulf of Martaban and I landed some distance off the shore of Burma with the engine knocking like a London bus. During the days spent on the coast I lived with some fishermen, who were very kind by day but stole my money and my clothes by night. I arrived in Rangoon in a vest and had to wait some time while a pair of trousers was fetched before I could leave the cockpit. Later on we returned to Borneo by ship to fly back the other machine. We then flew to Chittagong to make a survey of the forest areas there. This was a very pleasant time. The weather was delightful and I think everyone enjoyed it. We frequently landed at Cox Bazaar to refuel. There is a wonderful beach for bathing and lying about in the sun. I was sorry when the job was finished, and we had to leave. After another visit to the Malay States, in the course of which we carried the first Rangoon-Penang air mail, I returned to England, full of enthusiasm over the possibilities of aviation in the East.

"Some months were spent in preparing an expedition and then my partner and I left Croydon in two decrepit D.H.9 aeroplanes, amid the jeers of those present. It was confidently predicted that we would never reach Paris. Our aeroplanes were about eight years old, and had come from Belgium. Our second-hand engines had done some hundreds of hours flying and came from Holland. We had little faith but a lot of hope. Our route was Brussels, Paris, Dijon, Lyons, Marseilles, Pisa and Rome. In Dijon we bought two amazingly checked caps to wear in Rome. We were disappointed however. The caps of the Romans put ours in the shade and they remained unnoticed. From Rome we went to Malta and across the Mediterranean to the north coast of Africa. It was a stormy day and the experience cured me of any wish to fly over water with a single-engined machine. We went on to Cairo and Palestine, where we gave our first passenger flights. These proved popular and we prided ourselves on leaving Palestine richer than we entered it. From Jaffa we flew to Amman in Trans-Jordan, where there is a Royal Air Force Squadron. It is about 2,500 ft. up and the aerodrome is not large enough for a heavily-laden machine. We therefore decided to make our take-off for Baghdad from the plain of Ziza, where one can get a run of about two miles. Our machines were carrying a very big load of petrol as well as our engineer, photographer and a large amount of spares, stores and personal luggage. For amusement we marked off our take-off run with empty petrol tins every hundred yards, and the wheels left the ground at the 1,200-yard mark. At Baghdad we did a little passenger flying, but it did not seem popular and so we left for Basra. On arrival there we learned that a detachment had been sent to Kuwait to quell some disturbance and we thought it would be good fun to go there too. Passenger flying went well, but all payment was made in silver rupees which we were unable to change into notes and we arrived back at Basra with a sack full of money. From there we flew on via Bushire, Bandar Abbas, Jask and Charbar. This was before the days of Imperial Airways and the route was not properly organised. And so finally we arrived in India, a good deal further than Paris.

"In India we were faced with the necessity of earning money. Up till then the flight had been rather a holiday. Both of us had wanted the experience of flying to India, and I personally had enjoyed it. We had also realised that our enthusiasm for the development of aviation, even if infectious, required a long period of incubation before breaking out, and although we could have told any capitalist how to make a fortune, they were all generous enough to forgo their opportunity in someone else's favour. Under the guise of spreading the gospel of flying, we set out on a tour of India which lasted, apart from visits to England, for nearly three years. During that time I flew at nearly every centre of importance, and our machines carried many thousands of passengers without accident. It proved to be a far tougher proposition than we anticipated. Few aerodromes existed and landing grounds had to be made in most places. We were sometimes sued for damages to grounds and sometimes for

trespass by people who realised that time was precious to us and that we would rather pay than go to Court. On the whole we met with kindness. The attitude of Government officials varied from place to place. Most of them gave every help possible, but there were exceptions. To anyone wishing to learn the practical side of aircraft operation from the bottom upwards, I recommend a trip of this nature. Being unheralded by scarlet coated putta-wallas makes one learn to know the country quicker than anything I know. Having your capital locked up in aeroplanes makes you extremely careful. The necessity of keeping aeroplanes in the air earning money enforces good maintenance. It is comparable to starting life in the chorus to get a grounding on the stage.

"After my second visit to England I returned alone in a machine which still flies each week on the Tata Air Line. It was from the experience gained with this machine that the idea of operating an unsubsidised air line grew. The same machine is, I believe, the only landplane to have flown from London to Colombo.

"It is eleven months since you were addressed on the subject of aviation, the last speaker dealing with the past, present and future of air mail services in India, and in particular, gave a brief *résumé* of the conception and birth of the Tata Air Mail. As I participated in both these evolutions, it is all the more gratifying for me to be able to tell you how that air mail service has fared during its first year.

"The most noteworthy achievement was an unbroken record of regularity. Such a record is the object of all air line operators, but not many make it in the first year. This is all the more remarkable when the length and terrain of our route and the exceptionally severe weather conditions are taken into consideration. Our route crosses desert, swamps, mountain ranges 5,000 ft. high, and lies over country which receives more than 250 inches of rain a year. During the south-west and north-east monsoons, for nearly seven months of the year, parts of our route are subject to conditions of bad visibility, caused by storms with violently turbulent atmospheric conditions, making instrument or blind flying extremely difficult and fatiguing. The Tata Air Mail—the first Indian air line—has chalked up a score that anyone can shoot at, but no one can better. During the 160,000 miles flown, no unscheduled landings were made on account of mechanical trouble. Our engines fly approximately three times farther between overhauls than a railway locomotive, and our engineering staff is one man per 40,000 miles flown.

"I hope that by this time you are duly impressed with the efficiency of this particular air mail service. You may argue that such records cost money, that Tatas have poured out money to achieve worth-while results, and that while you applaud their patriotism in cutting out a hot trail for others to follow, air transport does not appeal to you as an investment. Regular air transport is generally regarded as being possible only when subsidised. It is therefore interesting to note that our unsubsidised air mail service is now making a profit.

"Air transport may be divided into two categories, that which is directly subsidised by the State, and that which is paid for services rendered. In my opinion, direct subsidies, although necessary in the early days of air transport when aeroplanes were so uneconomic that it was impossible to make them pay except by selling space at a prohibitive rate, have now become undesirable. A company in receipt of a direct subsidy is apt to become lazy just as a child left among quantities of easily obtainable food. An organisation existing upon payment for the services it renders to the public has a strong incentive to increase its efficiency to obtain a greater volume of business.

"If aviation is to grow and be able to give its full benefits, it must be provided with the ground organisation necessary for safe operation in all weather conditions by day and by night. No company can face the expense of laying out the necessary facilities, and it is the responsibility of every government to bear this burden. It may be argued that by providing efficient ground organisation, a government is indirectly subsidising aircraft operators. This, however, is as unsound a line of argument as to say that shipping is subsidised because governments provide wireless, lighthouses and docks. It would be equally untrue to say that governments subsidise private motorists or motor-bus companies by providing them with good roads.

"It would seem that the best method of building up an efficient system of air transport is by granting air mail contracts and by providing every modern aid to safe flying. One example will illustrate the result of this policy. In America two air lines provide a service between New

York and the West Coast six times daily. The distance of 2,800 miles is flown in 20 hours at an average speed, including stops, of 140 m.p.h. The air mail between India and England, handicapped by the lack of night flying facilities, averages about 36 m.p.h.

"In India the Government has done little to encourage flying. They have wisely refused to pay subsidies and have even more wisely realised that the development of this new form of transport is better left in the hands of private enterprise which can, and does, take financial risks that could not be taken with public money. But the Government must accept the blame for the lack of any ground organisation apart from that on the Trans-India route. There is not an aircraft wireless station south of Calcutta. The Meteorological Department accomplishes wonders in spite of all handicaps. But except on the Trans-India route, the Meteorological Department cannot supply aviators with current weather reports; it can only supply a forecast based on observations usually 24 hours old. Bombay possesses the only civil aerodrome south of Calcutta, and that is only serviceable in fine weather. The average distance between recognised landing grounds on the Tata air route is 320 miles.

"As regards the future of flying in India, services are being developed in the north by Indian National Airways, who run a daily service between Calcutta and Dacca and a weekly service between Calcutta and Rangoon. The Madras Air Taxi Service is soon to open a line between Calcutta and Madras.

"Tatas have long been aware of the desirability of linking Bombay and Calcutta by air. Obviously, to be of any use, the service must be a daily one; later on, perhaps, more frequent. To show real benefit over existing transport, it must leave one terminus after midnight and arrive at the other terminus not later than midday. This would enable letters posted overnight to be delivered early on the following afternoon. After very thorough investigations we are of the opinion that the route should be inaugurated by high-speed mail carriers. Later on, mails and passengers would be carried together in larger machines flying the same schedule, if not faster. Our application to the Government has been sent in, and we are ready to begin operations within 12 months of the completion of negotiations. Needless to say, no subsidy is asked for. We hope the Government will provide facilities for flying a small portion of the route before dawn, will make an all-weather landing ground at or in the neighbourhood of Nagpur and will add any equipment necessary to the wireless stations at Bombay and Nagpur to enable them to work with aircraft. The cost of this organisation per mile of air route would be about Rs. 300/-. This compares favourably with the Rs. 75,000/- to 200,000/- per mile required to build a railway. It is hoped that the small sum necessary to develop this route will find some place in the coming Budget, otherwise delay is bound to ensue before the preliminary organisation can be undertaken. All of you here to-day are business men, and it is not necessary for me to stress the importance of rapid communications as an aid to prosperity.*

"More landing grounds are needed if private and taxi flying is to become popular and useful. Cheap machines exist to-day capable of flying between any two points in India in one day, but their use is limited by the lack of aerodromes. A great opportunity exists for enterprising municipalities to remedy this by laying out grounds near their towns. Free advice on the subject of sites can be had from the Government or any operator, and the area required is only about 500 yards square. Municipalities in England have realised the importance of putting themselves on the air map, and the number of aerodromes there is increasing rapidly. I do not believe in dwelling too much on the future. It induces a tendency to hang back until the better things promised materialise. India, although late, has made a good start, and I would urge you to use the services which exist to-day. They will grow fast enough.

"Nothing can stop the development of aviation in India, but a great deal can be done to let it develop. It is significant that commercial air transport was born and is becoming lusty in this country in the depths of a slump. A story is told of a friend of mine named Blatherwick that, while stopped in a traffic block in London one Armistice night, he threw a lighted bunch of squibs behind the policeman on point duty. When threatened with the penalties of the law he said, 'You can take my name, you can take my number, but you can't stop those damned crackers.' And so it is with flying."

* (This proposal has been rejected by the Government.—Ed.)

Airport News

CROYDON

LUCKILY visibility from 3,000 ft. was excellent last Saturday, and 38 passengers of Imperial Airways, Ltd., saw the boat race perfectly from a "Heracles" at 3,000 ft. Apart from the fact that you may expect Cambridge to be in front on these occasions in these days, I am told that it is perfectly easy to distinguish the light or dark blue oar blades from 3,000 ft. Much depends on piloting, too, and under the able handling of the big machine by Capt. W. Rogers everybody saw the race in comfort. Two loudspeakers in the cabin gave the B.B.C. broadcast, too, and, thanks to the quietest of all air liner cabins, every word was clearly audible. Four or five "Autogiros" distinguished themselves by keeping pace with the boats, and Surrey Flying Services sent several machines from Croydon.

During last week there were severe gales. Pilots reported Channel boats with waves breaking right over them at a time when a brimming glass of water would not have spilled in the aeroplane cabin. One air passenger stated that he had to stop looking down at the ships below, otherwise he would have been sea-sick!

Some difficulty was experienced in handling very large aircraft on the ground in the gales. This was mainly due to a combination of very wet ground and very strong wind, and one machine accomplished a sideways skid of some 40 ft. If pilots, in these circumstances, kept their machines strictly head to wind and awaited ground assistance instead of attempting to turn, no difficulty would arise in most cases.

Monday saw the promised inauguration of the Croydon-Plymouth service via Southampton of Provincial Airways, Ltd., operating with "Fox Moths." The outward machine left at 10 a.m., and reached Plymouth at noon. One passenger was carried. The return service was at 11 a.m. from Plymouth, arriving Croydon at about 1 p.m. Afternoon services were operated in both directions, and in the interests of safety, owing to very bad weather, the inward afternoon machine landed near Cranleigh, proceeding to Croydon later. I think the company is to be congratulated on this. It is always tempting, especially on the inaugural day, to push through and maintain the schedule, but to put safety first is the way to win the public confidence in the long run.

Another new service was also started on Monday, between Croydon, Nottingham, Manchester and Glasgow. Commendable prudence was shown by this company also in announcing that the service, for the first week, was being run without passengers to test the possibility of operating this very difficult line to schedule. This service is being run with Airspeed "Couriers" by London Scottish & Provincial Airways, Ltd. In spite of bad weather, the machines were able to make the journey in both directions.

It is quite like old times to see an "air liner" coming in to the tarmac after landing with a traffic hand trotting along at each wing-tip. Once upon a time all high-wing monoplanes had to be secured with wing-tip hooks, grasping which the men were more often swinging in the air than on the ground, and most other types required a ground crew who, though they ran like hares, were frequently left behind or bowled over in the mud.

On Saturday last Mr. Handley Page was seen at Croydon entering a Fokker F.12 of K.L.M. en route for Berlin via Amsterdam. Mr. Fokker can do no less than take a ride in a "Heracles" in the near future. There has been much uninformed comment lately about the differences in efficiency between European and American civil aviation. Comparisons are always odious, especially when the subject is ill-understood. In shipping circles it is quite unusual to invite comment on shipping policy even from a liner captain, and certainly never from one who has crossed the Atlantic in a yacht. Nor, I believe, were the railway driver and stoker who recently took a British train through America and Canada regarded afterwards as experts on every branch of rail transport.

In no country is the ship's captain or the air line pilot an expert at anything but his own job, and anyone not acquainted even with the commercial pilot's job, however expert in flying an aeroplane, is not, therefore, qualified to

discourse at large on major questions of air line operation.

Climatic conditions make European and American air line work very different propositions, and I know one pilot who has very frequently flown the Amsterdam-Batavia route, and incidentally the Atlantic, who will say that the worst weather conditions to be found anywhere, in his opinion, are between the English coast and Croydon. As for night flying in Europe, the following figures of outward journeys of German Airways night freight and mail machine from December 1, 1933, to March 15, 1934, show what can be done even in the depth of winter in the English and European climate. Services operated, 213. Services cancelled, 18, or 8.5 per cent. On four occasions winter services were operated to Essen or Hanover instead of Cologne when that terminus was impossible. The fastest time on this night service was made by Herr Drechsel on Junkers J.U.52 D-2409 on December 8, 1933. He left Cologne at 02.40 and arrived Croydon at 04.23, an average speed of 186 m.p.h.

A quaint device which has puzzled many people is the painting of a huge red cross on a portion of the black and white chequer-board boundary fence. Being on a white panel, it looks as if the flag of St. George from some neighbouring church tower had been hung over the fence to dry. An Air Ministry official revealed to-day that it was to indicate the gate in the fence, in case of emergency.

A. VIATOR.

HESTON

CAPT. T. NEVILLE STACK and MR. F. E. CLIFFORD left Heston at 10.15 a.m. on March 15 in Mr. Clifford's new "Leopard Moth," supplied by Brian Lewis & Co., of Heston. It is understood that they will take the most direct route to Bathurst, on the West Coast of Africa, and then turn inland to Bamako. If available landing grounds are in good condition, the flight will be extended to the Gold Coast and Nigeria. Up to the present time the route is regularly flown by Air-France as far as Dakar. The Casablanca-Dakar section is, however, a mail service only, and a written record of this flight should serve to focus public interest on the possibility of air travel down the West Coast of Africa, and light aeroplane touring in general. (See FLIGHT, page 254, March 15).

Two D.H. "Leopard Moths" left Heston last week on delivery flights to the Continent. One, piloted by Mr. Barrington, was delivered to Mr. Moench in Paris, and Mr. G. de Havilland, Junior, flew another out to Antwerp.

In spite of predictions of bad weather for the Boat Race last Saturday, the D.H. "Dragon" of Wrightson & Pearce, of Heston, left the ground with a full complement of passengers in bright but somewhat gusty weather. Flying east from Heston the crowds lining the banks of the river were soon in sight, and the "Dragon" arrived over Putney in time to see the Oxford crew paddling out, and even at the regulation minimum height of 2,000 ft. the colours of the blades were easily distinguishable reflected in the sun. Turning in left-hand circuits of the course, the progress of the race could be followed with the utmost ease, and was made even more interesting by the running commentary received in the cabin on a portable wireless set. The charge of 30s. was moderate for a very enjoyable trip of 40 mins. in the air, and there can be little doubt that the aeroplane is the best medium for viewing spectacles of this nature.

Hatfield aerodrome beacon

An aerodrome beacon has been installed in the S.E. corner at Hatfield Aerodrome, Latitude 51° 56' N., Longitude 0° 15' W. This light is operated nightly, for one hour from half an hour after sunset, and shows a white flashing light of 0.92 second duration every 5 seconds. Its range of visibility in clear weather is approximately 38 miles. The time of operation of the aerodrome beacon can be extended if prior application is made to the aerodrome control. Pilots are reminded that the fact that the aerodrome beacon is in operation does not imply that night landing facilities are available; prior application must be made if night landing flares are required.

Airisms from the Four Winds

Portuguese flight to India

SENHOR CARLOS BLECK, the young Portuguese civil pilot referred to in FLIGHT of March 1, duly arrived at Pangim (Portuguese India) on the afternoon of March 5, after a flight which was not without certain difficulties occasioned by adverse weather conditions. When the news of his safe arrival reached Portugal, the President of the Portuguese Republic, General Oscar Carmona, sent him a telegram of congratulations. The total distance flown was 6,606 miles (10 631 km), which is about 95 miles more than had been calculated. Total flying time was 62 hr. 35 min., which gives an average speed of practically 105 m.p.h. (170 km/hr). In the various reports Senhor Bleck has sent home, no mention has been made so far of any trouble with the machine or engine *en route*, in spite of sundry "botheration" due to weather conditions. Senhor Bleck "rested" (*i.e.*, had to suffer festivals and banquets got up in his honour) a few days. He left Pangim on Sunday, March 11, and flew to Bombay, 261 miles (420 km) in 4 hr., his progress being retarded by head winds. On the 12th he reached Diu, from where he sent a telegram to the Aero Club de Portugal informing them that he was tired and intended taking it easy on the return flight. On March 13 he reached Karachi, and on March 15 he was to fly to Jask, or possibly Lingah. At the time of writing news was received in Lisbon that he had been taken ill, and would probably have to discontinue his homeward flight.

Projected Lisbon-Timor flight

LT. HUMBERTO DA CRUZ, a pilot of the Portuguese Aeronautica Militar, has projected a flight to Timor, which is the only Portuguese overseas possession not yet visited by air. Timor is 10,873 miles (17 498 km) from Lisbon, according to the route chosen, *viz.*, Lisbon-Oran-Tunis-Tripoli - Benghazi - Alexandria - Rutbah-Basra-Lingah-Jask-Karachi-Jodhpur-Allahabad-Calcutta-Akyab-Rangoon-Bangkok-Alor Star-Singapore-Batavia-Surabaya-Soembava-Dilly. It is understood that the flight will be carried out with the assistance of the daily newspaper *O Seculo*, and Lt. Cruz is hoping to get material assistance from administrative authorities and bodies all over the country and colonies. According to a Press report published in Lisbon on March 14, the Minister of the Interior is preparing a circular letter to be sent to all the Civil Governors in Portugal and Colonies authorising all local government bodies to subscribe, within the limits of their financial resources, and within the principles governing municipal accountancy, in response to the appeal launched by Lt. Cruz, for funds to enable him to carry out the flight. Lt. Humberto da Cruz, accompanied by Senhor Bleck, carried out the Lisbon-Loanda-Lisbon flight in 1930, also on a de Havilland "Gipsy Moth" biplane.

A BUSINESS TRIP: Officials of Pass & Joyce, distributors of Talbot cars in London and Home Counties, recently made a tour of inspection of their area in a "Dragon" belonging to Olley Air Services, and are shown here in our picture. The group includes Capt. Olley, who is standing in the doorway of the plane, and shaking hands with Mr. A. H. Pass. Next to Mr. Pass are his co-directors, Mr. C. J. Joyce and Mr. S. H. Devey, while Capt. C. R. F. English, the manager of Pass & Joyce, is next in line, slightly behind Mr. Devey.



An Oases Circuit in Tripoli

UNDER the auspices of His Excellency General Balbo, Governor of Tripoli, the Tripoli Aero Club is organising a meeting similar to the Oases Competition of the Aero Club of Egypt, which was held last December. Final approval has not yet been given to the rules of the meeting, but it is probable that it will be held in May this year and that the circuit will be Tripoli, Nalut, Tgutta, Gadames, Sinauen, Mizda, Beni Ulid, Misurata, Homs and Tripoli.

Byrd's aeroplane crashes

A REPORT from the Antarctic states that the Fokker monoplane which Admiral Byrd, of the U.S. Navy, was using on his expedition, crashed near its camp and was completely wrecked. On his last expedition Dick Byrd did not take a Fokker but a Curtiss "Condor." If, therefore, the machine which crashed was a Fokker, it must have been the Fokker used by Byrd on a previous expedition, which was left behind in the Antarctic. It appears rather unlikely that after all these years the machine could be got into a state fit for flying.

The Russian rescue work continues

AFTER being reported missing for some days, the Soviet pilot, Liapidevsky, who had set out from Wellen Camp at East Cape to continue his rescue work, was later stated to have been found alive and well. In the meantime the fate of those still left on the ice floes is causing anxiety, as Professor Schmidt has reported that the large floe on which the party was encamped had broken in two. General Nobile is stated to have advised the use of small airships for the rescue work, and two are said to have been conveyed by train to Vladivostok, whence they will fly to the scene of the wreck of the *Chelyuskin*.

Soviet airmen land in Manchukuo

A RUSSIAN bombing aeroplane is reported to have landed near the lesser lake Khanka, some 30 miles within the Manchukuo border, the occupants being detained by the police.

Civil aerodrome for Beirut

SEVERAL aerodromes are to be constructed in the countries under French mandate, according to M. de Martels' economic plan. Two aircraft have been presented to the Beirut Aviation Club by the French Air Minister, and the Municipal Councillors suggested, on the occasion of the presentation, that a civil aerodrome should be constructed at Beirut. This suggestion was approved by the Council, and a committee of four members is making a report.

UNUSUAL MARKINGS: An Armstrong - Whitworth "Atlas II" ("Panther IIa") supplied to China. On the port top plane is the squadron marking. The national marking is carried on the starboard wing.



Campbell's "night out"

WHILE on a flight from Luderitz Bay to Walvis Bay, in South-West Africa, the aeroplane carrying Sir Malcolm Campbell, piloted by Mr. Fulford, made a landing on soft ground and stood on its nose, causing some slight damage to undercarriage and propeller. It was decided that Mr. Fulford should fly the machine back to Luderitz Bay for repairs, Sir Malcolm staying behind so as to lighten the damaged machine for the take-off. Mr. Fulford returned next day and picked up Sir Malcolm, who apparently had spent a somewhat miserable night, having suffered a good deal from the cold.

Maryse Hilsz flies to Tokyo

FOR the second time Maryse Hilsz has made the Paris-Tokyo trip, using a Breguet machine fitted with a Hispano Suiza engine.

Dr. Eckener to visit London

AT the invitation of Sir Evelyn Wrench and the Council of the All People's Association, Dr. Hugo Eckener is to visit London next week. The famous German airship pilot will be entertained to lunch at Claridge's on Tuesday next, and in the evening he will address a meeting at the Scala Theatre, the subject being "The Future of the Airship." We gather that no more tickets are available.

Site of Sheba discovered?

THE *Morning Post* on March 10 stated that the following telegram had been received in Paris from M. André Malraux, the French author and explorer: "Have discovered legendary site Sheba, Twenty towers or temples still standing. On northern edge Rub-el-Khali. Have taken photographs." M. Malraux secretly left Paris on February 22. When, in December last year, he won the Prix Goncourt for his novel "La Condition Humaine," M. Malraux said that the money was indeed life and death to him, for he was about to undertake a flight over a desert and could then buy more petrol.

What Rhodesia would like

A STORY is told that when an aeroplane was circling over the small station of Umtali for the first time, a European asked a native who was gazing up at it if he would like a flight. The African replied "No, but I should like a sitting of the eggs."

Some Russian gliders

TWENTY new types of gliders are being built by Osoaviakhim (Society for Air and Chemical Warfare) for the All-Union gliding meeting to be held during the summer. Kochetkov, a constructor and pilot, has built a very small craft with a span of 11 metres, a length of 5.41 metres, and which weighs, in flying order, 145 kilogrammes. This is the smallest glider in the U.S.S.R. Another particularly interesting glider is that constructed by Kolesnikov, which, in appearance, resembles a seagull. As it is intended for long-distance flights, it is being equipped with radio apparatus and signals for night flying. An attachment for towing purposes is provided. A "triangular glider," whatever that may be, has, according to a correspondent, been constructed by the engineer Chera-novsky. The pilot Groshev has produced a four-seater glider with attachment for towing, and Gribovsky has constructed the first Soviet seaplane glider.

Master air pilot No. 2

RECENTLY we recorded the granting to Capt. L. A. Waters, of Imperial Airways, of a Master Air Pilot's Certificate. Now another I.A.L. pilot, Capt. F. D. Travers, has been granted the certificate, and is thus the second to obtain it.

Air defence in Italy

AIR defence experiments on a large scale were carried out on Monday in the principal Italian cities along the southern Adriatic. Air "attacks" were launched on the chief centres of Puglia and Lucania.

A Lorraine diesel

THE Lorraine Company is experimenting with a new nine-cylinder radial air-cooled Diesel engine. One pump per cylinder is provided, and the power is 270 h.p. at 1,800 r.p.m.

Salmson news

THE well-known French engine firm, Salmson, is reported by our excellent French contemporary *Les Ailes* to have several new and interesting types coming along. Among them are a six-cylinder in-line engine of 8 litres capacity, and a heavy-oil engine designed under Szydlowski patents. The 12-cylinder Vee engine of 8 litres capacity intended for the next Coupé Deutsch will not, after all, take part in this contest, as the Bernard machine in which it was to have been installed cannot be got ready in time. The Bernard-Salmson combination may, however, make an attempt on certain world's records.

New Zealand buys "Vildebeestes"

THE High Commissioner for New Zealand announces that the New Zealand Government has placed an order with Vickers (Aviation), Ltd., for 12 "Vildebeeste" torpedo bombers (Bristol "Pegasus" engines) for the New Zealand Defence Department. The New Zealand machines will be similar to those of the Royal Air Force. The first two machines are due for delivery about June.

Aircraft in the naval manoeuvres

DURING the recent naval manoeuvres between the Azores and the coast of Spain and Portugal, the "Red" fleet was given a preponderance of carrier-borne aircraft, which were intended to give it a superiority in certain respects. A heavy gale made it impossible for any aircraft to take off, and the "Red" Admiral, Sir William Fisher, had to rely for information on his cruisers. These, perhaps, with the aid of good luck, supplied the necessary information, and the "Blue" fleet was successfully brought to action.

Co-ordination of the Services

IN the House of Commons on Thursday, March 15, Wing. Com. James called attention to the need for closer co-operation between the three Services. He said that the position of unit training between the Army and the Air Force to-day was extremely unsatisfactory. Both Services were looking inward instead of outward. The mental attitude of the staffs of the three Services tended to train for a war conducted by their own arm alone, and that that particularly applied to the Air Force. Mr. Duff Cooper, Financial Secretary to the War Office, in reply, said that there was a plan to have an extensive operation off the coast of Yorkshire this year in which a skeleton division of the Army, the whole of the Home Fleet, and four or five squadrons of the R.A.F. would take part. He said that throughout the Army there was tremendous appreciation of the importance of the Air Force and a desire to do everything possible to understand it.

International conference at Geneva

THE 35th International Aviation Conference, which originally was to have been held in Brussels, will now be held from April 23 to 27 at Geneva. Austria, Belgium, Czechoslovakia, Denmark, France, Germany, Great Britain, Holland and the Saar Territory will be represented. The closing of the conference will coincide with the opening of the International Aero Show at Geneva.

Newtownards Aerodrome

WORK has been started on the construction of the new aerodrome at Newtownards, County Down, which is about 12 miles from Belfast. This will be the first civil aerodrome in Ulster, and will be used by Midland & Scottish Air Ferries, Ltd. Hitherto this company has used the R.A.F. aerodrome at Aldergrove, County Antrim.

NEW AIRCRAFT

The Bernard 52 C I

DESIGNED primarily as a twin-float seaplane fighter, the Bernard 52 C I is rather similar, in general design, to the types 74 and 75 single-seater fighters which were entered for the recent French "Concours des Avions de Chasse." As may be seen from the G.A. drawings, the air-



THE BERNARD 52 C I before proceeding to St. Raphael for official tests.

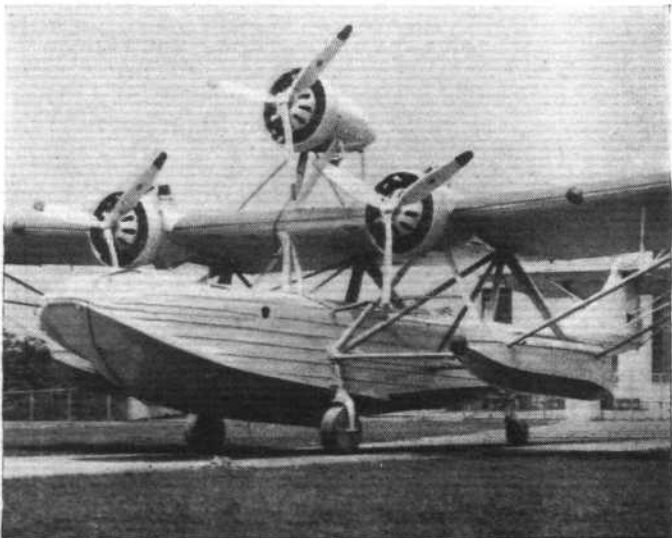
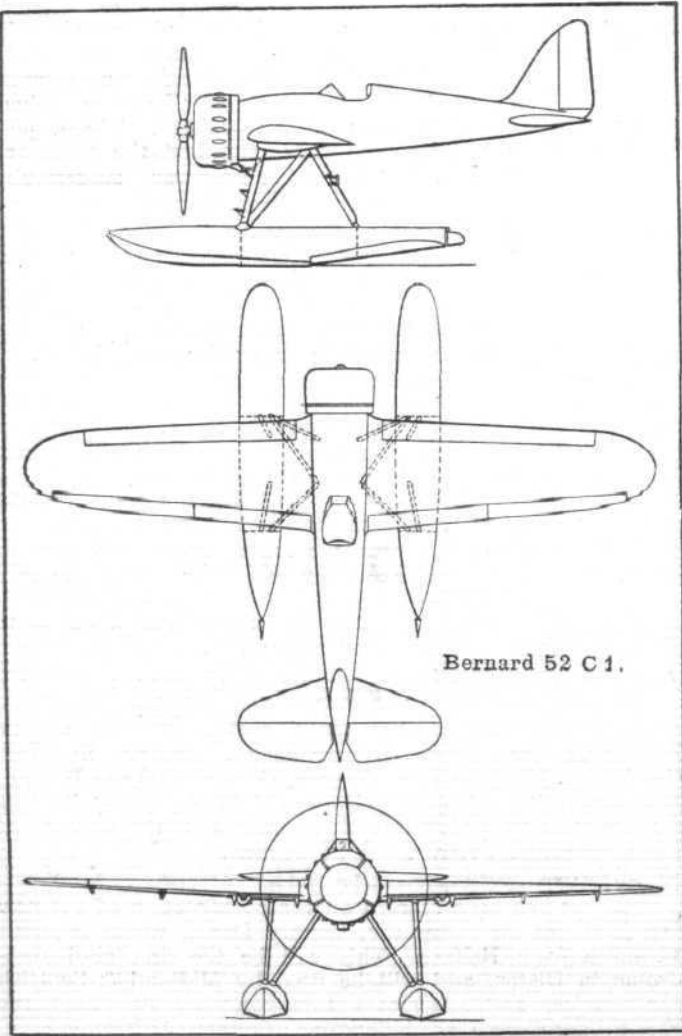
craft is a mid-wing cantilever monoplane with divided float undercarriage. This type of undercarriage was chosen in order to allow a bomb to be carried centrally under the fuselage. (Which might indicate that the machine may be used for "dive bombing," a method of attack for which single-seater fighters seem to be coming increasingly popular, e.g., the American Curtiss and Boeing fleet fighters.) Fittings for catapult work are provided. Duralumin is the chief material used for the construction of this machine. Handley Page slots are fitted along the greater part of the leading edge of the wing, and trailing edge flaps of high aspect ratio are provided for a low

BERNARD 52 C I.			
Span...	..	..	37.73 ft. (11.5 m)
Length ..	..	..	24.44 ft. (8.67 m)
Height ..	..	..	14.26 ft. (4.35 m)
Wing Area ..	..	..	195.91 sq. ft. (18.2 m ²)
Weight loaded ..	..	..	4,019 lb. (1 827 kg)
Speed at 11,483 ft. (3 500 m)	..	..	205 m.p.h. (330 km/h.)
Ceiling ..	..	..	27,887 ft. (8 500 m)
Climb to 16,404 ft. (5 000 m)	..	..	7 min.
Stalling speed ..	..	..	61 m.p.h. (98 km/h.)

landing speed. In connection with the Handley Page slots, we would remind the reader that the French Air Ministry recently concluded an agreement with Handley Page, Ltd., whereby the French Air Force and the French manufacturers may fit these slots to their aircraft. One other interesting feature is that a portion of the fuselage and the main structure of the wing are built integrally, as in some previous Bernard fighters. Sheet duralumin covering is used for the fuselage, which is of oval section. The section of the fin is unusually thick. At present, a Gnôme-Rhône K-9 engine of 500 h.p. is fitted, enclosed in a N.A.C.A. type cowl, but a later version of this engine, which gives 600 h.p. with no increase in weight, may be substituted. The performance figures given in the table apply to the aircraft fitted with the older type engine.

The Martin 121 Flying Boat
UNUSUAL, in that it may be used as either a twin-engined or triple-engined type, the Martin 121, or,

MARTIN 121	
Dimensions	
Span ..	100 ft. (30.5 m).
Length ..	61 ft. 2½ in. (18.66 m).
Height (three engines) ..	20 ft. 9 in. (6.32 m).
.. (two engines) ..	15 ft. 10 in. (4.82 m).
Wing area ..	1,204.2 sq. ft. (111.87 m ²).
As a Three-engined Type	
Weight empty ..	12,700 lb. (5 761 kg).
Normal patrol weight, loaded ..	20,175 lb. (9 151 kg).
Overload patrol weight, loaded ..	23,150 lb. (10 501 kg).
Normal wing loading ..	16.75 lb./sq. ft. (81.78 kg/m ²).
.. power loading ..	11.70 lb./h.p. (5.31 kg/h.p.).
Maximum speed ..	143 m.p.h. (230.1 km/h.).
Landing speed ..	67 m.p.h. (107.8 km/h.).
Climb in 10 minutes ..	6,600 ft. (2 012 m).
Service ceiling ..	14,600 ft. (4 450 m).
As a Twin-engined Type	
Weight empty ..	10,115 lb. (4 580 kg).
Patrol weight, loaded ..	18,435 lb. (8 380 kg).
Wing loading ..	15.3 lb./sq. ft. (74.7 kg/m ²).
Power loading ..	16.0 lb./h.p. (7.26 kg/h.p.).
Maximum speed ..	127.5 m.p.h. (205 km/h.).
Landing speed ..	64 m.p.h. (103 km/h.).
Climb in 10 minutes ..	4,420 ft. (1 480 m).
Service ceiling ..	10,800 ft. (3 290 m).
Range at cruising speed ..	1,900 miles (3 060 km).



THE MARTIN 121 flying boat as fitted with three engines.



The Martin 121 flying boat as a twin-engined machine.

as it is known in the U.S. Navy, the XP2M-1, is one of the largest flying boats developed for the U.S. Navy. It is intended primarily for long-distance patrol use, but is convertible for duty as a bomber.

The aircraft is an externally-braced high-wing monoplane, the wing consisting of a centre section and two outboard sections. Structurally, the wing is composed of two riveted truss type spars of aluminium alloy, aluminium alloy channel section ribs, double drag bracing and fabric covering. Balanced ailerons are fitted. One of the highly successful features of the aircraft is the use of the two outboard floats, which are of riveted aluminium alloy construction, as the main fuel containers. These are carried by the wing-bracing structure. With two auxiliary fuel tanks in the centre section the entire hull is kept open for the use of the crew, the space normally occupied by fuel tanks being so utilised.

Riveted aluminium alloy construction is used for the hull, which has a deep Vee bottom and two steps. The main vertical fin supporting the tail surfaces is built

integral with the hull. There are five compartments in the hull separated by watertight bulkheads fitted with large watertight doors. The tail unit is of the monoplane type with twin fins and rudders carried on the main fin which is built integral with the hull.

The tail plane is adjustable through 6 deg. and the rudders are fitted with trailing edge "tabs" adjustable from the pilot's cockpit. All moving parts have external lubrication fittings.

Either two or three 575-h.p. Wright "Cyclone" geared radial air-cooled engines driving metal tractor airscrews are fitted. The nacelles are mounted in the leading edge of the centre section and, in the case of the three-engined type the centre engine nacelle is carried on struts above the wing. Electric inertia starters are operated from the mechanic's control panel.

Normally the crew consists of pilot, assistant pilot, wireless operator and two gunner-mechanics. An enclosed cabin is provided for the pilots, and bunks and living accommodation are arranged within the hull.



SHORT BROTHERS ANNUAL STAFF DINNER, 1934

THE staff of Short Brothers, Rochester, held their annual dinner at Pinolis' Restaurant, Wardour Street, London, on Saturday, March 3.

The party, comprising 125 members of the staff, left Chatham on the 2.55 p.m. train, in special saloon coaches provided by the Southern Railway. An excellent dinner was served at Pinolis' Restaurant, Wardour Street, W. After dinner Mr. A. Gouge, general manager, proposed the toast of "The Firm," coupled with the name of Mr. H. O. Short, managing director.

Mr. H. O. Short, who was greeted with prolonged cheers, replying to the toast, thanked those present for the very cordial way in which they had received him, and went on to say that the gathering was the largest for some years past, which he was pleased to think was a happy reflection of the greater activities of the firm, the works being more busy now than for some considerable time. He believed that these activities would continue and in all probability increase in the future. The prospects were good, but, as some of those present knew, the firm had ploughed some very rough ground since the Armistice, and he could only hope that as a result of the increase activities the firm would enjoy a period of greater financial prosperity.

Speaking of the work of the Air Ministry officials attached to the firm, Mr. Short paid tribute to the work of both Mr. P. H. Harrower, chief A.I.D. inspector, and Mr. J. A. Manson, resident technical officer, who,

together with their staffs, carried out their official duties, which, although arduous, were always mingled with a spirit of co-operation and helpfulness. He took that opportunity of thanking them for their assistance and for the amicable relations which existed between them and the works officials with whom they deal.

In conclusion, Mr. Short referred to the splendid work done by Mr. A. Gouge, general manager; Mr. W. P. Kemp, works manager; Mr. J. H. Wood, secretary; Mr. A. E. Bibby, works manager aircraft; and the various other chiefs of departments, whose teamwork had been mainly responsible for the firm's technical achievements being made known throughout the world.

He also proposed a very hearty vote of thanks to Mr. Alfred Craig (Secretary, Sports Club), who, in conjunction with a small committee, had been responsible for providing what he termed a very excellent evening's pleasure.

Replying on behalf of the Air Ministry officials, Mr. P. H. Harrower thanked Mr. Short for the very kind reference he had made, and assured him that their one aim was to assist the firm with the many difficulties it had to face in the production of machines.

After dinner the party re-assembled at the Garrick Theatre, where they enjoyed a first-class programme of Old Time and Modern Variety Artists.



Marcel Bloch busy

As previously recorded in FLIGHT, the Société des Avions Marcel Bloch has made an agreement with the Potez Company. The former firm has now decided to extend its works at Courbevoie, as the following orders have been received:—Six M.B.200's of an order for 40 machines of this type for the French Air Ministry (the remaining 34 are to be constructed by Potez), six M.B.120

colonial transport aircraft, two twin-float seaplanes similar in general design to the type 200, and a low-wing multi-seater fighter with two Gnôme-Rhône K.14 geared and supercharged engines. Excellent results have been obtained with the type 200, which is a high-wing cantilever military monoplane with two K.14 engines mounted below the wing. For a loaded weight of 13,700 lb. (6 200 kg), the top speed is 186.4 m.p.h.

SOME DEVELOPMENTS IN AIRCRAFT CONSTRUCTION

By H. J. POLLARD, Wh.Ex., A.F.R.Ae.S.

A summary of the lecture delivered before the Royal Aeronautical Society on Thursday, March 15

MR. POLLARD confined his lecture for the most part to the consideration of the problems of stressed skin construction. He fixed the minimum practical thickness of the covering material at 0.02 in., a condition which he considered ruled out the use of steel and made that of light alloy imperative, and taking the simple bending theory as being true, determined that the maximum stresses in the skin of a covered fuselage caused by the vertical component of the tail skid loading to be from 2 to 6 tons/sq. in. He considered that the use of a corrugated skin could be ruled out owing to the drag involved and, therefore, that internal reinforcement by means of hoops and stringers of angle, channel or other suitable section riveted to the skin was necessary. He lucidly explained the forms of buckling which were to be expected in a structure of this nature when subjected to compressive and/or shear loads. He favoured Professor von Karman's formula (*Ref. 2*) and (*Ref. 3*) to obtain the effective width of sheet between the reinforcements:

$$2w = C \sqrt{E/p} \times t$$

Where $2w$ = effective width of sheet.

p = crippling stress at failure.

t = thickness of the material.

E = Young's Modulus of the material.

C = constant.

He pointed out that this formula referred only to reinforced flat sheets or those having small curvature (*Ref. 4*). Dealing then with the form of buckling to be expected owing to shear, he showed that this formed diagonally and differed appreciably from that due to compression, and that as it was normal practice to leave the stringers and hoops unconnected, the sheet had to carry the whole of the shear load and the reinforcing had to resist all the components of force from the pull of the sheet.

The formula $p = kE (t/b)^2$ was used to show the crippling stress in panels under shear or compression.

Where p = crippling stress.

E = Young's Modulus.

t = thickness of the sheet.

b = width of sheet.

k = a constant.

From this formula it was shown that it was possible to place the various structural materials in their order of merit, but it was pointed out that while the value of E for steel was about three times that of aluminium, yet the latter can be approximately three times thicker than the

former for the same weight of panel, and, as the buckling load increases as the cube of the thickness, it did not at the moment seem probable that the desirable properties of steel outweighed the disadvantage of weight.

Attention was drawn to R. & M. 1553, "Summary of the present state of knowledge regarding sheet construction," by H. L. Cox, a publication which rendered it easy for anyone to become conversant with the problems of thin sheet construction. Reference was also made to the work of Mr. S. C. Redshaw, of the Imperial College Civil Engineering staff, and his work "Elastic instability of a thin curved panel subjected to an axial thrust," published in R. & M. 1565. Mr. Pollard considered that Mr. Redshaw's results proved that it was fundamentally sound to estimate the strength of a large component, as for example a monocoque fuselage, from a test on a small element representing the construction at the most highly stressed part. He considered that the theoretical crippling stresses were practically independent of the length of the specimen and that a test specimen having the correct curvature and breadth, and being of a convenient length, might easily be constructed and tested by applying loads, moments and shears of the values which would be found at that particular section of the whole component; a great practical advantage over constructing and testing a whole fuselage.

While not wishing to give the impression that the problem of the strength and stiffness of reinforced smooth sheet construction had been solved, Mr. Pollard stated that investigations of the subject were being actively pursued at the Bristol works on behalf of the Directorate of Scientific Research. Part of this work was also an investigation of the all-important matter of holes in the covering, but this had not proceeded far enough for the establishment of formula.

Turning then to the consideration of wing spars and wing covering, the investigations of Professor Wagner (*Ref. 7, 8, 9, 10*) and Dr. Mathar (*Ref. 11, 12*) were discussed, particularly with reference to the use of thin sheet web girders and the methods whereby undue buckling of the web could be avoided. He pointed out also that the web performed another duty in addition to resisting shear loads, in that it assisted the sheet covering in stabilising the spar booms. The important effect of a rigid wing covering for monoplanes in increasing the torsional stiffness of the wings was also discussed, and Batho's formula (*Ref. 14*) was taken as being the best for estimating the loads of any members of a wing under torsion, while the stresses in the spar webs could be estimated by the method adopted by Wagner. Mr. Pollard discussed at some length

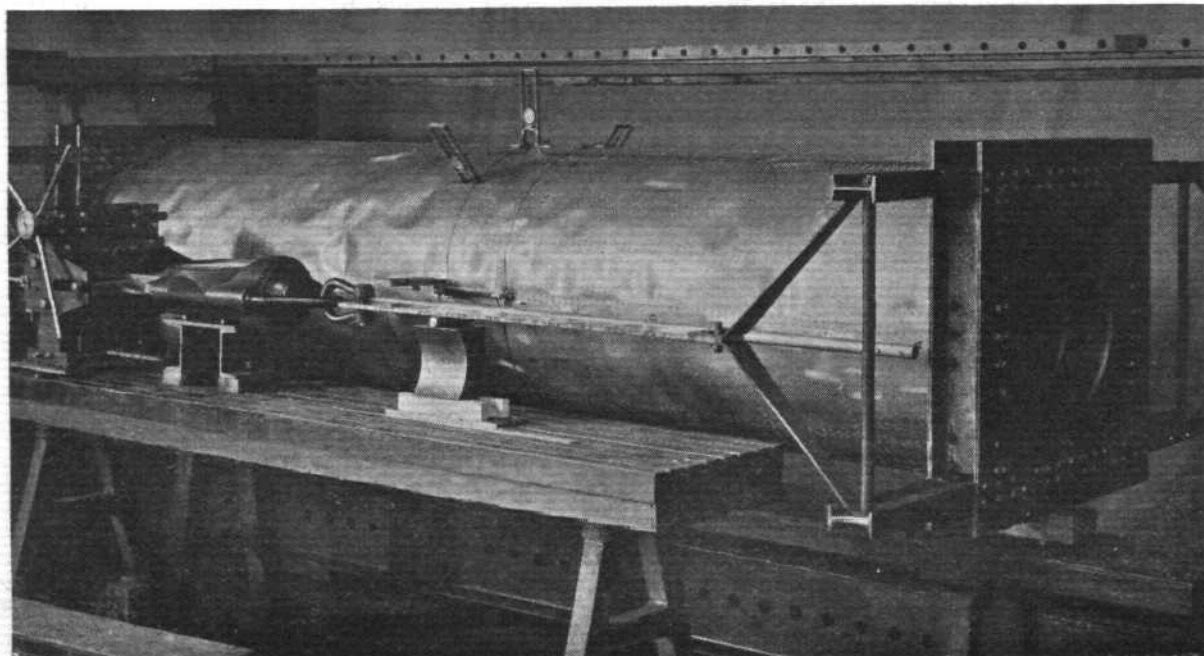


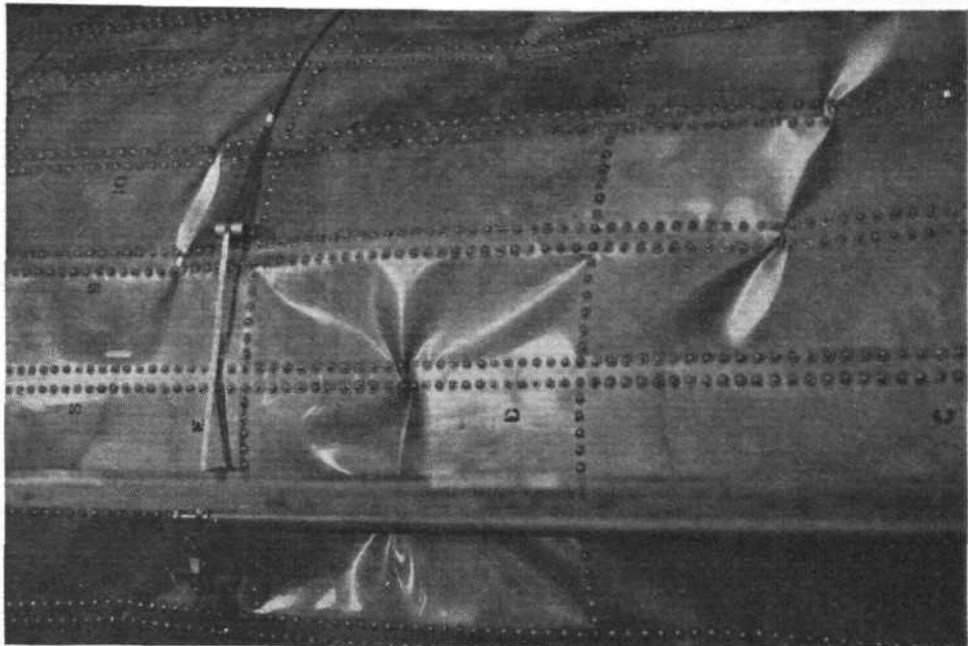
Fig. 1 : Surface in compression. Elastic buckles. Permanent buckle at one stringer.

Fig. 2: Appearance of surface when stringers buckle.

the question of the use of multi-spar wings, considering in particular the economic distribution of the material and the cost, Burgess's method (*Ref. 14*) of estimating the forces in the separate members of a multi-spar wing due to torsion, being used.

Concerning the question of manufacture, the lecturer said that panel beating on a large scale could be avoided by the use of developable surfaces and by careful selection of the shape of sheeting. The stringers and hoops should be continuous, the hoops being deeper than the stringers and a hole cut in the former to allow the uninterrupted passage of the latter, no connection other than through the medium of the skin being necessary between the hoops and stringers. Rivetting was stated to be a most expensive item, and every effort should be made to reduce it. A search for means to do this had brought to the fore the question of electric resistance, spot or roller welding. Two causes had delayed their general adoption by aircraft manufacturers, the first being the scarcity of suitable materials which after welding, and without subsequent heat treatment, have mechanical properties requisite for aircraft structures, and the second the absence of fool-proof welding machines. Several of these latter were, however, now said to be available. Owing to the increase in drag on the skin due to the use of snap heated rivets (*Ref. 15*), flush rivetting was very desirable, and electric resistance welding made an obvious appeal for this reason as well. Much experimentation had been done at Bristol in connection with steel spars, and reference was made to the effective after-welding heat treatment of Ni-Cr steel spars by A. V. Roe, Ltd., at Newton Heath, Manchester, where the spars were assembled by roller welding and the complete member heat treated by the electric resistance method (see *FLIGHT* for April 27, 1933).

Interest was also shown in the recently discovered atomic hydrogen method of welding developed by Metropolitan-Vickers, Ltd., which appeared to have definite advantages over oxy-acetylene in as much as carburisation or oxidation of the weld could not take place. As there can be no question of heat treatment of light alloy, stressed skin structures, subsequent to welding, the production of reliable welds in these materials seemed improbable, until the



aluminium-rich Mg-Mn alloy known as 4S. was tried. This alloy was made to Air Ministry specification D.T.D.209, and fatigue tests have shown it to be most consistent so far as welding was concerned. This material has been developed by the Northern Aluminium Company, and the following table gives its physical properties.

PHYSICAL TESTS ON 4S SHEET MATERIAL						
Gauge		Yield Stress tons/sq. in.	0.1 per cent. Proof Stress tons/sq. in.	0.5 per cent. Proof Stress tons/sq. in.	Max. Stress tons/sq. in.	Elongation per cent. on 2 in.
4SO..	0.040	4.87	8.1	8.75	12.5	16.0
4SH	0.022	11.1	12.75	13.4	13.95	4.0
	0.036	—	12.45	13.5	14.15	6.0
	0.064	12.95	13.3	13.4	14.05	6.0
4SH	0.018	11.9	13.3	14.7	15.5	4.0
4SH	0.018	13.3	14.70	15.5	16.3	3.5
	0.048	15.6	16.25	17.2	17.65	4.0
	0.016	13.7	15.8	17.3	17.8	3.0
4SH	0.064	16.9	17.55	19.0	19.1	3.0
	0.048	—	15.7	16.9	17.9	5.5

E = 4,400 tons per sq. in.

Coming to the subject of corrosion, Mr. Pollard dealt briefly with both stove enamelling in the case of steel, and anodic treatment for aluminium alloys, referring also to special corrosion resistant materials such as Alclad and steels of the "two-score" type.

References

2.—The strength of thin plates in compression. Pasadena Publication No. 13. A. & M. 54-5. Theodor von Karman, E. E. Sechler, and L. H. Donnell.

3.—Survey of problems of thin walled structures. Theodor von Karman, E. E. Sechler, and L. H. Donnell.

4.—N.A.C.A. Technical Note 455. Comparison of three methods for calculating the compressive strength of flat and slightly curved sheet and stiffener combinations. Eugene E. Lundquist.

7.—N.A.C.A. Technical Memorandum 490. Structures of thin metal, their design and construction. H. Wagner.

8.—N.A.C.A. Technical Memo-

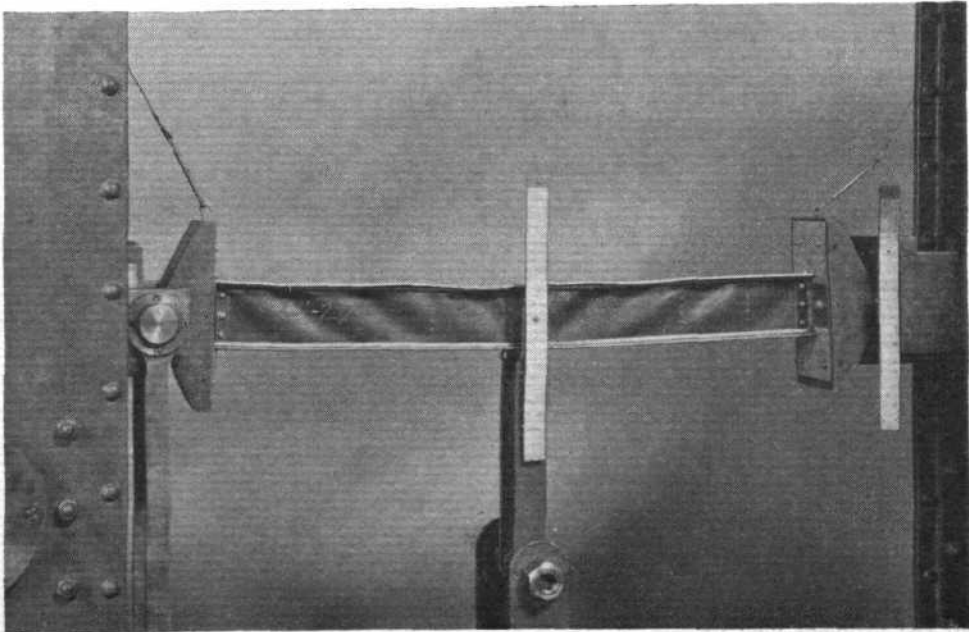


Fig. 6: Sheet-web spar. Stiffeners widely spaced. Booms deformed.

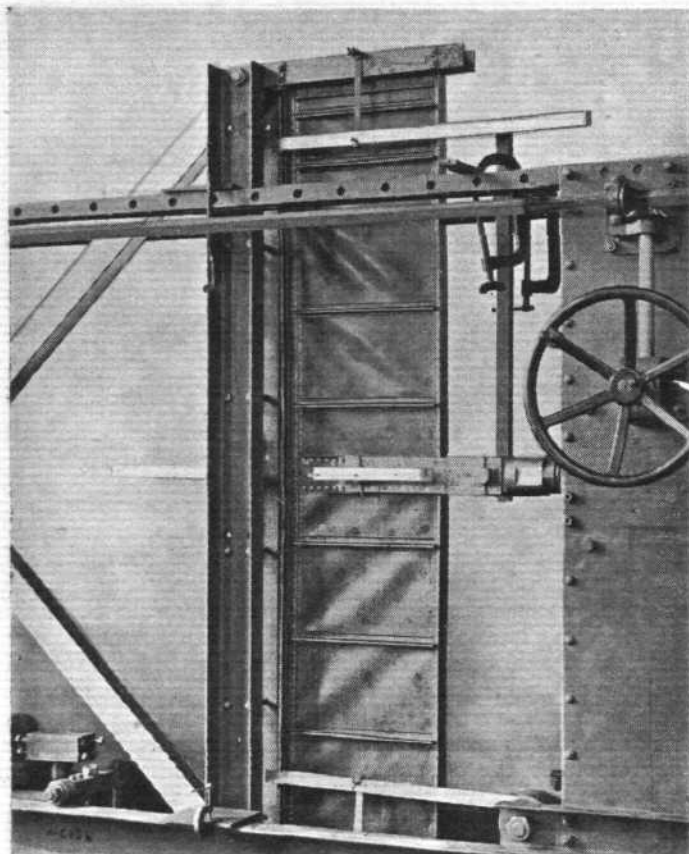


Fig. 7: Sheet-web spar. Correctly spaced stiffeners. Booms not deformed.

- random 604. Flat sheet metal girders with very thin metal webs. Part I. H. Wagner.
- 9.—N.A.C.A. Technical Memorandum 605. (604) Part II. H. Wagner.
- 10.—N.A.C.A. Technical Memorandum 606. Part III. H. Wagner.
- 11.—N.A.C.A. Technical Memorandum 592. Metal covering of airplanes. G. Mathar.
- 12.—N.A.C.A. Technical Note 469. A summary of design formulae for beams having thin webs in diagonal tension. Paul Kuhn.
- 14.—N.A.C.A. Technical Note 366. Torsion in box wings. John B. Wheatley.
- 15.—N.A.C.A. Technical Note 461. Effect of rivet heads on the characteristics of a 6-ft. by 36-ft. Clark Y metal aerofoil. C. H. Dearborn.

(Throughout; the reference and figure numbers, as used in the original paper, are adhered to. In order to assist designers, Mr. Pollard co-related the mathematical part of his paper, and the formulae referred to in a series of appendices, together with the bibliographical references, will be dealt with at a subsequent date in THE AIRCRAFT ENGINEER.—ED.)

The Discussion

Mr. H. E. Wimperis (Director of Scientific Research) presided at the meeting and, in opening the discussion, he remarked that the work carried out at Bristol was considered to be very important, as would be recognised by the fact that the Air Ministry had helped to advance it. It was always easy to get money, he said, but it was not always easy to get men able to carry out research work of this character. Generally speaking, there was not usually much trouble in finding funds for really good pieces of research work, but it was very rare to find the kind of man who could do the work and pay a dividend on the expenditure. In Mr. Pollard, however, working with Capt. Barnwell, they had found a combination which amply satisfied the Air Ministry, and he was glad of the opportunity of saying so on the present occasion. The work that had been done bore testimony to the ability of Mr. Pollard, who frankly confessed that there were enough variables in the construction to keep the problem new for some years to come. One of the features of this method of construction was the great stiffness which it offered.

Research work recently in regard to wing torsion, flutter of every kind and tail buffeting had indicated how easy it would be to build an aeroplane which would be amply strong enough for everything, but utterly failing in stiffness for flying so that the kind of construction which would give the strength that is needed and at the same time the stiffness, which required to be increased, he suspected, with increasing speeds, was very necessary.

Mr. S. C. Redshaw (Imperial College, Civil Engineering Staff), referring to the statement in the paper that in the box-type of construction the stresses in spar webs can be estimated by Wagnerian or other methods, whereas with the skin the case was different, since that part of the structure is subjected to both shear and longitudinal forces, suggested that that was not altogether justified. The spar webs would be called upon to take direct stresses caused by bending, and, in addition, shear stresses and the web would tend to wrinkle close to the compression flange. Thus the strength of the spar would be lowered accordingly. If the strength of the web was calculated from shear stresses only, a wrong estimate of the strength would probably be obtained. With regard to the author's remarks concerning atomic-hydrogen welding, he believed the average welder was not able to weld thinner than 18-gauge. The author had mentioned 0.02 in. for the thickness of the covering. Did this render atomic-hydrogen welding too expensive or impossible to be generally used?

Mr. W. D. Douglas (Mechanical Testing Department, R.A.E., Farnborough) remarked that stressed skin structures become extremely complicated from the structural point of view as soon as the skin is fitted with a stiffening system. It was very frequently convenient to consider a structure like a stiffened-skin structure as divided up into components, but whilst it was convenient it was sometimes dangerous to draw conclusions founded on the assumption that the parts could be regarded as separate structural units. In general, a stiffened skin might be regarded as a tubular form of construction fitted with stiffening members, some of which ran longitudinally—and might be called stringers—and others ran transversely—and might be called rings or hoops. The author had referred to the investigations at present being carried out by the Air Ministry, in which considerable attention was being paid to various new forms of spacings of the stringers. He drew attention to a quotation by the author, on page 9, from Mr. Redshaw, in which he stated that the theoretical critical stresses in a curved-skin construction in compression—he believed—were practically independent of the length of the specimens. It was known that with short specimens there were certain end effects, due to the impossibility of introducing shear, and end stresses as they existed in the complete fuselage. Therefore, whether or not we could justifiably use short specimens could not be determined merely by calculations, but must be checked by experiment.

Further on, the author referred to the effect of end load on the shear buckles in the webs, and suggested that probably these would be affected by the end load. In this connection it was interesting to look at Fig. 7. In

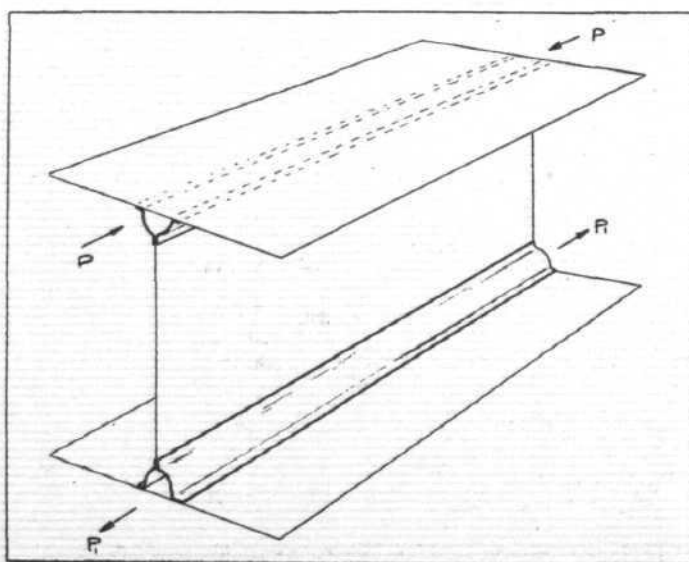


Fig. 8: Spar booms, each stabilised by two sheets at right-angles (wing covering).

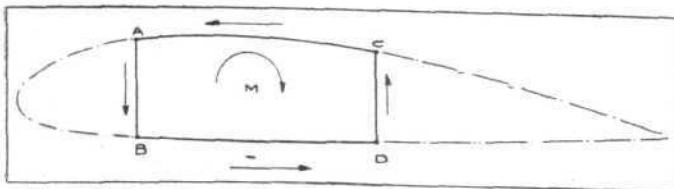


Fig. 9 : Method of resisting torsion in box wing.

that illustration there were some well-marked shear buckles in the webs. In that particular specimen the load was being applied towards the right-hand side, so that the left-hand side of the vertical boom would be in compression and the right-hand side in tension. Examining this illustration, there was not much difference in the appearance of the buckles. Presumably, if the end load was having any great effect on the form of the buckles, one would expect the buckles to be running in a more or less perpendicular direction on the compression side and in a tangential direction on the tension side. Therefore, that illustration rather suggested that probably the effect on the shear buckles was not going to be of any great practical significance, so far as that type was concerned.

A rather strong point had been made of the fact that any vibration test of complete spars to be of use should include representative fittings, holes and some accidental irregularities, but the spars shown in the illustration appeared to have loading boxes at the points at which the vibrating mechanism was attached. Could the author say whether the failure he got in these spars was influenced by, or was directly due to, the presence of these fittings, and, if so, was it quite fair to judge the merits of the two processes unless the loading boxes had been specifically designed to suit these processes?

Miss L. Chitty (*Oxford University Engineering Laboratories*) said it was ten years ago that she was associated with Mr. Pollard in work on methods of construction. In the early work they were feeling their way as regards transferring to metal from wood construction, and she was impressed with the great strides that had been made since then. The field of research was enormous, and it was important that the practical side should go hand in hand with the theoretical consideration of these problems. Dealing purely with the theoretical and mathematical side, there was always the fear that one was being led away from the direction in which it was desirable to go. In carrying out theoretical work, therefore, it was essential always to keep in mind the relationship of theory and practice, and from that point of view the paper was of special value.

Mr. M. Langley (*De Havilland Technical School*) said that Short Bros., if not the first, were among the first people in this country to be interested in the metalclad fuselage. The Bristol Company might have carried out earlier work, but, at any rate, it was satisfactory to find that early work vindicated after something like 15 years. The paper was valuable in that it translated into engineers' language work which had existed for many years in mathematicians' language, and as such it would be appreciated by all the technical and engineering members of the Society.

One important aspect was not only the bare initial cost, but also the subsequent maintenance cost. If that were taken into account he believed the result would be greatly to the advantage of metalclad. In the case of a multi-spar metalclad wing there was presumably less concentration of load at the roots than was the case with the normal wing structure. In the Junkers the reactions were transmitted not into the metal skin but into the braced section of the fuselage, and gradually died out towards the tail as the loads became less. Consequently the stresses could be more easily taken by the metal skin. Similar constructions were used, or had been used, by Spartan, Handley Page, and Vickers. In R. & M. 1553, to which the author referred, Mr. Cox appeared to support Pesca's theory that one could take 50 times the thickness of the skin as working in tension with the structural members. Mr. Pollard, however, did not mention Pesca. Was it to be taken that he had compared Pesca and Von Karman and had come to the conclusion that Pesca's formula was much too crude for aircraft? As far as he had been able to work out from various information which came to him, if one followed the old directions and concentrated loads into as few structural members as possible, with a considerable amount of secondary structure in the way of fuselage,

fairings, etc., which were doing no primary work at all, the results were almost inevitably greater weight, and he hoped that this paper—indeed, he was sure of it—would do a lot towards killing the prejudice that had existed against the metalclad fuselage.

Mr. H. A. Mettam (*Westland Aircraft Works*) said that it still appeared that the design of stressed-skin structures was a matter for the engineer, and in that connection he said he wished to define an engineer as the man who was capable of making reasonable assumptions based upon insufficient data!

The author had restricted the appearance of buckles to one-third of the fully factored load, but it would be useful to know if that had been based on the three-quarters yield requirements insisted upon for military aircraft, and could it be assumed that buckles, on the basis of one-third of the fully factored load, would be fairly elastic.

In using Von Karman's formula, did the author consider the values given for constant C in his Ref. 4 were correct, or had the author any different experience on the point. Since this paper had been prepared, Technical Note No. 479 had been issued in America, and that appeared to give a rather different law for the variation of permissible stresses with thickness-radius ratio. In connection with stressed-skin constructions, was it desirable to go in for multi-spar construction? Quoting from memory the figures of the Dornier aircraft, he said, he believed the weight added by skin covering in the case of the small aircraft Dornier-Libelle, and later the Dornier-Waal, was about 50 per cent., whilst in the case of a larger machine the addition was only 20 per cent. One of the points it was desirable to find out was, at what stage in the size of aircraft would the stressed-skin construction become worth while?

Mr. D. L. Hollis Williams (*Fairey Aviation Company*) remarked that fabric was about the only material which had never given any trouble, and thus we had stuck to our braced structures and biplanes which hitherto we had thought more efficient. A point that had not been mentioned was that, with a fabric cover, a thin wing machine relieved itself at high speeds from the point of view of very high local fabric pressures. A thick wing machine had not the same capacity, due to its heavy camber, of relieving itself. There were very big opposing forces on the top and bottom surfaces and the fabric wing probably became a corrugated wing, and it was because of that that we should, eventually, have to have recourse, on the high-speed machine, to the metal cover. One objection to the metal cover, which must be got over before it could be adopted on a service basis, was the lack of facilities for inspection. That did not, perhaps, apply to the fuselage, because it was possible to crawl down it for the purposes of inspection, but in the case of the wing the tendency was to build a box which was rivetted up and became more or less like a salmon tin, and the only way to get into it was by means of a tin-opener.

Mr. Pollard, in the course of a short reply to the discussion, referring to atomic hydrogen welding mentioned by Mr. Redshaw, said that so far as he was aware this had only been applied successfully to steels. He believed it had been tried on 18-gauge alloy, but generally speaking not very much progress had been made with it in this application. As to the combined shear and end load effect on the wing dimensions, so far as it had been possible to ascertain, this did not affect the appearance of the buckles to an extent that really mattered. These buckles appeared somewhat appreciably less than was indicated by the formula. Whether there had been end load present or not, the waves would appear in every case, but at a rather lower value than that calculated. Concerning the theoretical stresses being practically independent of the length of the specimen, there were conditions in which one would not care to make the length less than twice the diameter. He did not quite follow Mr. Douglas's comment with regard to Fig. 7. Actually the end load was carried on the vertical carrier at the side.

The question of cost, mentioned by Mr. Langley, was, of course, the bugbear at the moment. The substitution of all-metal construction for wooden construction was exceedingly costly when the work was begun 15 years ago, but since then the disparity between the costs of the two methods was nothing like so great. There was nothing intrinsically expensive in shell construction. It was, of course, necessary to get the jigs together, as well as the riveting tools and welding machines, but he did not think it would be more costly eventually. As to the formulæ,

he thought he had mentioned Von Karman's formula in the paper. At any rate, he thought it was better than Pesca's 50 times the thickness, because if one watched a buckle forming as the load increased, the greater the buckle the less the skin became defective. As the stress increased the width decreased, so that one could not simply take Pesca's formula, because the width of the buckle varied with the stress. The use of stressed-skin construction, referred to by Mr. Mettam, was just a matter of saving weight. One of the slides showed a single-seater fuselage in steel sheeting, which in its complete form was only 30 lb. heavier than the fabric-covered fuselage. In duralumin, the weight would probably have been 20 lb. lighter. Using metal 0.020 in. thick meant that fabric would be heavier, and in duralumin the skin of the fuselage would at any rate be as light as a girder machine. He had not gone into the appearance of the elastic buckle, but rather wished he had said one-quarter of the full factored load. To keep

the buckles out of the construction up to one-third of the fully factored load was asking rather a lot. Plastic deformation at three-quarters of the factored load was another matter. There would not be plastic deformation in the skin until the stringers began to buckle, and he did not think there was much chance of that. Also, in reply to Mr. Mettam, the author said he had used Von Karman's formula and the constant referred to in Ref. 4. He had not, however, seen the Technical Note 479 mentioned, and, therefore, could not give any information on the point. As to the question of inspection, there was something in what Mr. Hollis Williams had said. In the case of the fuselage, however, it was possible to have some large inspection holes and still have plenty of strength. As to the wings, the leading and trailing edges could be made detachable so that at any rate everything could be seen. Putting anything right that might be wrong was another matter.



BRITISH AEROPLANES FOR DENMARK

Eight De Havilland Machines for Danish Air Force

WITHIN the next few days a fleet of eight de Havilland aeroplanes will leave Hatfield aerodrome to fly to Copenhagen in charge of officers of the Danish Air Force. The flight will be under the command of Capt. C. C. Larsen, who will pilot the "odd" machine of the flight, a de Havilland "Dragon." The other seven machines are "Tiger Moths."

The seven "Tiger Moths" will be used for the instruction of Danish pilots in the art of military air manoeuvres, and the equipment of the machines includes all the instruments necessary for "blind flying." Instrument flying

is a relatively recent development of military flying training, and Great Britain has, perhaps, done more than any other nation to perfect the equipment. Following the adoption of instrument flying by the British Royal Air Force, nearly all other nations are adding it to their curricula.

The "Dragon" bought by the Danish Air Force is equipped for military purposes, and will also be used for light transport and for aerial survey.

All the machines of the batch are fitted with de Havilland "Gipsy Major" engines.



WAITING TO GO: Seven "Tiger Moths" and one "Dragon" at Hatfield, ready to start for Copenhagen. The Danish crews include Capt. C. C. Larsen, Lts. Clausen, Meincke and Rydman, Sgts. Eriksen, Petersen and Hansen, and Machine Officer Petersen. (FLIGHT Photo.)



No. 600 (City of Edinburgh) (Bomber) Squadron

A VERY attractive little publication is the annual report of the City of Edinburgh Squadron, A.A.F., for the year 1933. This is the first year for which an annual report has been issued, and so it includes a brief history of the squadron during each year of its existence since its formation in 1925. There are a number of illustrations well reproduced from photographs, including a full-page FLIGHT photograph of the squadron flying in formation. The letterpress is excellent, and gives a very clear idea of the manifold activities of the squadron, and of the keen spirit which pervades all ranks. If we might venture to make a suggestion for next year's report, we would say that interest would be increased if a narrative were given of the part played by the squadron in any Exercises in

which they may take part. There are two intimations in the report which fill us with regret. The Commanding Officer, Sqd. Ldr. Murray-Philipson, M.P., is resigning the command of the squadron, and the Adjutant, Flt. Lt. R. J. Legg, is being transferred to No. 30 (Bomber) Squadron at Mosul, Iraq. A combination of ill-health and Parliamentary duties is responsible for the resignation of the Commanding Officer. In a message to the squadron Air Com. MacNeece-Foster, A.O.C., No. 1 Air Defence Group, pays a handsome tribute to the work of both Sqd. Ldr. Murray-Philipson and Flt. Lt. Legg. The new Adjutant is to be Flt. Lt. G. F. Macpherson, R.A.F., while the command will devolve on Flt. Lt. Lord Nigel Douglas-Hamilton, second son of the Duke of Hamilton and Brandon. Thus the two Scottish squadrons will be commanded by two brothers, as the City of Glasgow Squadron is already commanded by the Marquess of Douglas and Clydesdale.

THE ROYAL AIR FORCE

London Gazette, March 13, 1934

General Duties Branch

P/O. on probation P. H. Agard Butler is confirmed in rank (Feb. 23); Acting P/O. on probation S. J. McN. Newman is graded as Pilot Officer on probation (Jan. 26); Sqdn. Ldr. C. H. C. Woolven, M.C., is placed on half-pay list, scale A (Feb. 27); Fl. Lt. P. G. Chichester is placed on half-pay list, scale A, from Feb. 18 to March 4, inclusive. The follg. Fl. Lts. are placed on retired list:—W. Wheatley (March 10); R. J. H. Holland (March 11).

Lt. E. W. Lawson, R.N., F/O., R.A.F., relinquishes his temp. commn. on retirement from the Royal Navy (March 3).

Memoranda

The permission granted to Sec. Lt. E. J. Burton to retain his rank is withdrawn on his enlistment in the Royal Army Pay Corps (Supplementary Reserve) (Feb. 6); the permission granted to Lt. M. W. Clark to retain his rank is withdrawn on his enlistment in the Royal Army Pay Corps (Supplementary Reserve) (Feb. 12).

PRINCESS MARY'S ROYAL AIR FORCE NURSING SERVICE

The follg. Staff Nurses are promoted to rank of Sister:—Miss E. V. Lamb (Dec. 1, 1933); Miss C. I. Walker (Jan. 31).

ROYAL AIR FORCE INTELLIGENCE

Appointments.—The following appointments in the Royal Air Force are notified:—

General Duties Branch

Wing Commander: A. S. Maskell to H.Q., R.A.F. India, New Delhi, 26.2.34, for "P" Staff duties vice Sqd. Ldr. N. S. Douglas.

Squadron Leaders: C. W. Busk, M.C., A.F.C., to H.Q., Iraq Command, Hinaidi, 26.2.34, for Armament duties. J. H. Dand, M.B.E., to No. 70 (B.T.) Sqdn., Hinaidi, Iraq, 26.2.34, for Flying duties. F. J. W. Mellersh, A.F.C. to H.Q., Iraq Command, Hinaidi, 26.2.34, for Air Staff duties vice Sqd. Ldr. R. P. M. Whitham, M.C. O. C. Bryson, M.C., D.F.C., A.M., to School of Tech. Training (Men), Manston, 7.3.34, for Engineer duties vice Wing Com. R. C. Hardstaff.

Flight Lieutenants: C. H. Brill to H.Q., Iraq Command, Hinaidi, 26.2.34. H. A. Constantine to No. 1 Armoured Car Co., Hinaidi, Iraq, 26.2.34. M. H. Ely to No. 8 (B) Sqdn., Aden, 26.2.34. C. L. Falconer to No. 1 Armoured Car Co., Hinaidi, Iraq, 26.2.34. A. King-Lewis to Station H.Q., Hinaidi, Iraq, 26.2.34. R. J. Legg to No. 30 (B) Sqdn., Mosul, Iraq, 26.2.34. R. T. Taaffe to H.Q., Iraq Command, Hinaidi, 26.2.34. M. Wible to H.Q., Aden Command, 26.2.34. P. G. Chichester to No. 1 School of Tech. Training (Apprs.), Halton, 5.3.34. H. A. Evans-Evans to School of Naval Co-operation, Lee-on-the-Solent, 4.3.34. V. Q. Blackden to No. 3 Armament Training Camp, Sutton Bridge, 7.3.34. F. W. Long to No. 604 (County of Middlesex) (B) Sqdn., Hendon, 8.3.34. W. E. G. Mann, D.F.C. to No. 32 (F) Sqdn., Biggin Hill, 8.3.34. D. R. Mitchell, M.B.E., to No. 2 Armament Training Camp, N. Coates Fitties, 6.3.34. G. C. O'Donnell, D.F.C., to R.A.F. Depot, Uxbridge, 5.3.34. R. Whitaker, M.B.E., to H.Q., Inland Area, Stanmore, 7.3.34. A. H. Simmonds to Reception Depot, West Drayton, 5.3.34. E. F. Waring, D.F.C., to No. 203 (F.B.) Sqdn., Basrah, Iraq, 5.3.34.

Flying Officers: G. Atkinson to No. 202 (F.B.) Sqdn., Malta, 3.3.34. J. Goodhart to No. 202 (F.B.) Sqdn., Malta, 3.3.34. D. Michell to No. 205 (F.B.) Sqdn., Singapore, 3.3.34. W. P. Simonds to No. 20 (A.C.) Sqdn., Peshawar, India, 26.2.34. J. C. Sisson to No. 202 (F.B.) Sqdn., Malta, 3.3.34. G. P. Woodhouse to No. 5 (A.C.) Sqdn., Quetta, India, 26.2.34. B. M. Cary to Air Armament School, Eastchurch, 7.3.34. R. W. P. Collings to Air Armament School, Eastchurch, 7.3.34. T. A. Jefferson to Air Armament School, Eastchurch, 7.3.34. A. Threapleton to Air Armament School, Eastchurch, 7.3.34. A. N. Combe to No. 203 (F.B.) Sqdn., Basrah, Iraq, 5.3.34. W. P. J. Thomson to Air Armament School, Eastchurch, 5.3.34.

Pilot Officers: A. O. D. Cox to No. 39 (B) Sqdn., Risalpur, India, 26.2.34. A. J. Kennedy to No. 20 (A.C.) Sqdn., Peshawar, India, 26.2.34. W. M. Graham to No. 27 (B) Sqdn., Kohat, India, 31.1.34.

THE ROYAL AIR FORCE BENEVOLENT FUND

THE first Council Meeting of the year was held at the offices of the Fund, on Tuesday, March 13, Sir Charles McLeod, Bart, Chairman and Honorary Treasurer, was in the Chair. The usual financial resolutions were carried. The Council were informed that Grants to the amount of £3,001 18s. 7d., had been disbursed since the last meeting on December 6, 1933.

The Auditors' accounts for the year 1933 were approved by the Council and note was taken of the fact that for the first time in the history of the Fund demands had been so great that expenditure had overtaken income. The possibility of this had already been anticipated and in spite of the grants expenditure being high, it actually represented a drastic cutting of grants. Whilst the Council recognize the necessity for reducing grants as an immediate necessity, they have under consideration the urgent need for increasing the income of the Fund and the steps that must be taken to enable grants to be given commensurate with distress and to place the Fund on a sound foundation for the future. The demand upon the Fund has been steadily growing and has always failed to reflect any temporary improvement in the labour market. The reason for this steady increase can be attributed to the fact that the Fund serves the Fighting Service on which a special call is made in peace time, as well as in war and the cases which must be a first charge on this Fund are accumulative and likely to be so for an indefinite period.

The Council are of opinion that if the general public realised what the R.A.F. Benevolent Fund was called upon to do in helping the disabled and the dependents of those who have given valuable flying service, not only in war but in peace, very generous assistance would be afforded.

The next meeting was fixed for Wednesday, May 23, 1934, at the offices of the Fund, at 3 p.m.

Transfer of Officers to the Reserve

THE undermentioned short-service officers should note that they become due on the dates stated for transfer to the reserve, or (where indicated) for

ROYAL AIR FORCE RESERVE RESERVE OF AIR FORCE OFFICERS

General Duties Branch

Lord Malcolm Avendale Douglas-Hamilton is granted a commn. as Flying Officer in class A (Jan. 4); F/O. T. B. Byrne is transferred from class A to class C (Nov. 28, 1933); F/O. C. R. A. Page is transferred from class BB to class C (May 20, 1933). The follg. Flying Officers relinquish their commns. on completion of service and are permitted to retain their rank:—A. L. Robinson (Feb. 5); W. Rogers (Feb. 26).

AUXILIARY AIR FORCE

General Duties Branch

No. 603 (CITY OF EDINBURGH) (BOMBER) SQUADRON.—F/O. Lord Malcolm Avendale Douglas-Hamilton resigns his commn. (Jan. 4).

No. 605 (COUNTY OF WARWICK) (BOMBER) SQUADRON.—P/O. N. E. Partridge is promoted to rank of Flying Officer (Feb. 24).

Stores Branch

Squadron Leaders: W. Thorne to H.Q., Iraq Command, Hinaidi, 26.2.34, for Equipment (Stores) Staff duties. L. H. Vernon to Supplies and Transport Services, Hinaidi, Iraq, 8.2.34, to Command vice Sqd. Ldr. H. S. F. T. Jerrard.

Flight Lieutenant R. H. Latham to No. 203 (F.B.) Sqdn., Basrah, Iraq, 26.2.34.

Flying Officers: G. C. Allen to No. 70 (B.T.) Sqdn., Hinaidi, Iraq, 26.2.34.

E. G. Ambridge to Aircraft Depot, Iraq, Hinaidi, 26.2.34. C. F. Harrington to Aircraft Depot, Iraq, Hinaidi, 26.2.34. E. G. Moore to No. 1 Armoured Car Co., Hinaidi, Iraq, 26.2.34.

Accountant Branch

Squadron Leader R. H. Cleverly to H.Q., Aden Command, 26.2.34, for duty as Command Accountant.

Flying Officers: L. Chegwidon to No. 30 (B) Sqdn., Mosul, Iraq, 26.2.34. D. Lumgair to H.Q., Aden Command, 26.2.34. C. G. Sharp to Station H.Q., Hinaidi, Iraq, 26.2.34. J. G. Wigley to Aircraft Depot, Iraq, Hinaidi, 26.2.34. G. H. White to Administrative Wing, Halton, 27.2.34.

Medical Branch

Squadron Leaders: C. P. Barber to R.A.F. Gen. Hospital, Hinaidi, Iraq, 26.2.34, for duty as Med. Officer. F. J. Murphy to Home Aircraft Depot, Henlow, 6.3.34, for duty as Med. Officer.

Flight Lieutenants: G. A. M. Knight to R.A.F. Gen. Hospital, Hinaidi, Iraq, 26.2.34. J. C. Neely to Aeroplane and Armament Experimental Estab., Martlesham Heath, 6.3.34. L. C. Palmer-Jones to R.A.F. Hospital, Aden, 26.2.34.

Flying Officers: J. F. Dales to R.A.F. Gen. Hospital, Hinaidi, Iraq, 26.2.34. W. P. Griffin to R.A.F. Gen. Hospital, Hinaidi, Iraq, 26.2.34. A. H. Osmond to R.A.F. Gen. Hospital, Hinaidi, Iraq, 26.2.34. T. H. Harding (Med. Quartermaster) to R.A.F. Gen. Hospital, Hinaidi, Iraq, 26.2.34.

Dental Branch

Flying Officer H. Keggin to R.A.F. Hospital, Aden, 26.2.34.

Chaplains Branch

Rev. J. Lavin to Home Aircraft Depot, Henlow, 2.3.34, for duty as Chaplain (R.C.).

relinquishment of commission, on completing their period of service on the active list:—

AUGUST-SEPTEMBER, 1934

Flying Officers:—*George Simpson Coleman, *Hugh Oswald Woodhouse (Aug. 12), Ralph Bagshaw Abraham, Adam Carter Bailey, John Langton Courtenay Banks, David Barclay, Ronald Joseph Cohen, Norris Kirkham, Reuben Michael Nobliston, William Joseph Scott, Graham Robertson Stroud, Leslie Watson, Ralph Leonard West (Aug. 15), John Croft Atkins, Edward Poole (Aug. 16), George Edward Bowes Stoney, Kenneth Maxwell Cass, Herbert Roy Clay, Geoffrey Good Dixon, Douglas Walter Harman Heath, Hugh de Montmorency Middleton, Reginald John Parkhouse, Alfred Clayton Richardson (Aug. 30), *Harold George Adams, Sidney Horace Bell, Derek Pierre Aumale Bötzel-Gill, Lawrence Edward Chiswell, George Byrne Stanislaus Coleman, Cecil Rhys Davies, John Llewellyn Mapletoft Davys, Stephen William Huntley Egan, John Stewart Hamilton, Clifford James Hansford, *Laurence Maylestone Hooper, Laurence Rayson Mouatt, Eric Edward Noddings, Robert Clive Parker, Ian Napier Roome, Keith Norman Sayers, Sydney Dennis Slocum, Charles Alan Washer, Hugh Joseph Wilson (Sep. 13).

Arrangements are to be made for the officers marked "+," who have been selected provisionally for permanent commissions, to be examined at the Central Medical Establishment during May, 1934, as to their physical fitness for such commissions.

Fleet Air Arm Squadrons and Flights

The following squadrons embarked in H.M.S. *Courageous* on February 20, 1934, from the stations stated:—

No. 800 (F.F.) Squadron—from Netheravon.
No. 820 (F.S.R.) Squadron—from Gosport.
No. 821 (F.S.R.) Squadron—from Gosport.
No. 810 (F.T.B.) Squadron—from Gosport.

* To relinquish commission. Not liable for R.A.F. reserve service.

Correspondence

The Editor does not hold himself responsible for opinions expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters intended for insertion in these columns.

BRITISH v. AMERICAN AIRLINERS

[2917] Being a Canadian, and therefore on the fence between Britain and the U.S.A., I am interested in watching aeronautical developments in both countries. My neutrality takes the form of boosting things British when talking to Americans, and boosting things American when talking to Britons. I take this opportunity of doing a bit of the latter in comparing two aircraft, the D.H.86 and the Lockheed "Electra," both of which have been recently described in FLIGHT. Never have I seen two aircraft so closely comparable in purpose, accommodation, weight, power and modernity. Not only do these machines afford material for a U.S.-British discussion, but also a new answer to the old questions of monoplane v. biplane and wood v. metal construction.

In this case we find that the American all-metal monoplane has the same useful-gross weight ratio as the British wood-and-fabric biplane, and 9 ft. 6 in. less span. The Lockheed's cruising speed is 30-35 m.p.h. higher than the D.H.'s, and its landing speed 9 m.p.h. lower; the maximum speed ranges are 3.41 and 2.36 respectively. (Incidentally, I think a landing speed of 72 m.p.h. should be appalling to Britishers since their standard objection to American aircraft has been their high landing speed.) Reducing the Lockheed's range to the 460 miles of the D.H. and giving it the same allowance for furnishings, radio, etc., we find identical payloads of 1,940 lb., so that their efficiency figures come to 0.320 and 0.272 (ton-miles/horsepower-hour) respectively. Passenger miles per h.p.-hour show 3.30 and 2.81, with 240 lb. allowance for baggage in each case.

The Lockheed lags then only in manoeuvrability with engine(s) cut, volume of cabin space, and probably in first cost. The D.H. should be credited with the first two of these points, although the Lockheed is not inadequate, while the difference in first costs will be overcome after five or six years' service when the D.H.'s fabric and plywood has been renewed several times. Incidentally these two machines are intended for use under very similar conditions: the D.H. on the Empire airway from Singapore to Australia, and the Lockheed on Pan-American Airways from Mexico to Buenos Aires. The D.H.86 figures are from official tests, I believe, while the "Electra's" are based on calculation, but the margin is great enough to leave little room for doubt. Finally may I say that I admire the D.H.86, as I do all D.H. aircraft, but only wish to point out that while it is above the average for ships of its type, it has not necessarily "taken a step in front of the rest of the world."

C. D. LONG.

Toronto, Canada.
March 7, 1934.

The Model Aircraft Club

At Stag Lane Aerodrome on Saturday, March 24, the Model Aircraft Club is holding, under the patronage of Capt. G. de Havilland, an exhibition of models, photographs, lantern slides, etc. From 11 a.m. till dusk on Sunday, March 25, there will be model flying on the aerodrome.

The College of Aeronautical Engineering

EACH year sees some improvement, both in the organization or the curriculum of the College of Aeronautical Engineering. The latest prospectus, which may be obtained from Sydney Street, King's Road, Chelsea, contains few deficiencies or redundancies. Although basically similar to those of previous years, the curriculum includes a number of new subjects. The list of Honorary Lecturers includes Mr. A. Nigel Norman, of Airwork, Ltd. ("Aerodrome Development"); Mr. Brian Allen, of Henlys, Ltd. ("Sales and Service"); Mr. R. F. Banks, of the Ethyl Export Corporation ("Fuels"); and Mr. J. D. Titler, of the Aircrow Co., Ltd. ("Aircrows").

IMPORTS AND EXPORTS

		Exports	
		1933.	1934.
		£	£
Jan. ..	..	82,963	255,437
Feb. ..	..	79,357	69,623
		162,320	325,060

Imports and Re-exports.—From January 1, 1934, considerable changes have been made involving re-classification of a number of articles. Under this re-classification apparently the value of aircraft imports and re-exports have been lumped with imports of locomotives and ships. It is therefore no longer possible to give the figures for aircraft imports or re-exports.

PUBLICATIONS RECEIVED

Air Review. Vol. I, No. 1, March, 1934. "Air Review," Fulwood House, Fulwood Place, High Holborn, London, W.C.1. Price 1s.
Aero-Engines, Inspection of, Before and After Overhaul. Aeronautical Engineering Series: Ground Engineers. By R. F. Barlow and A. N. Barrett. London: Sir Isaac Pitman & Sons, Ltd. Price 3s. 6d. net.
British Aeroplanes Illustrated. By C. A. Sims. London: A. & C. Black, Ltd. Price 3s. 6d. net.
Converting a Business into a Private Company. By Herbert W. Jordan. Jordan & Sons, Ltd., Chancery Lane, London, W.C.2. Price 1s. 6d. net.

NEW COMPANIES REGISTERED

AIR TOURS, LTD., 20, Market Street, Mayfair, W.—Capital £100 in £1 shares. Objects to establish and work lines of aeroplanes, seaplanes and aerial conveyances from and to all parts of the world, etc. Directors: Earl Bateman Fielden (managing director and chairman), Massafatts, Raikes Road, Skipton, Aeroplane pilot (director, Aviation Tours, Ltd.), Capt. Arthur D. Makins, D.F.C., 20, Market Street, W. (director, Brighton Road Racing Co., Ltd.); Samuel L. Harries, 11, Cornwall Gardens, S.W.7 (director Fasta Film Co., Ltd.).

VILLIERS HAY DEVELOPMENT, LTD., 48, Albemarle Street, W.1. Capital £7,000 in £1 shares. Aeroplane engineers and builders, type testers of engines and aeroplanes, etc. Directors: Charles A. Villiers, 22, Farm Street, W.1; Lt.-Col. Thomas W. Hay, Fulmer Place, Fulmer, Bucks.

W. E. PARKHURST AND CO., LTD.—Capital £400 in £1 shares. Acquiring the business of an aero and automobile engineer now carried on by William E. Parkhurst at Courtenay Garage, Oak Place, Newton Abbot, as "W. E. Parkhurst & Co." Directors: Wm. E. Parkhurst (managing director), Gertrude R. Parkhurst, both of 41, Torquay Road, Newton Abbot; Cyril G. H. Perriam, 3, Oak Place, Newton Abbot.

INCREASES OF CAPITAL

GENERAL AIRCRAFT, LTD. (Airport of London, Croydon).—The nominal capital has been increased by the addition of £99,900 in £1 ordinary shares beyond the registered capital of £100. The original 2,000 shares of 1s. have been consolidated into 100 shares of £1.

MONOSPAR CO., LTD. (Airport of London, Croydon).—The nominal capital has been increased by the addition of £37,600 in £1 ordinary shares beyond the registered capital of £12,400. The existing 8,000 "A" shares of 1s. each shall be consolidated into 400 ordinary shares of £1 each. The "A" shares so consolidated and the "B" shares in the original capital are to be henceforth known as ordinary shares.

CHANGE OF NAME

HORLEY SYNDICATE, LTD. (Victoria Coach Station, S.W.1.)—Name changed to Airports, Ltd., on February 16, 1934.

AERONAUTICAL PATENT SPECIFICATIONS

Abbreviations: Cyl. = cylinder; i.c. = internal combustion; m. = motors (The numbers in brackets are those under which the Specification will be printed and abridged, etc.)

APPLIED FOR IN 1932

Published March 22, 1934

- 23,500. D. NAPIER AND SON, LTD., G. S. WILKINSON, and C. W. SEWELL. Variable-speed transmission mechanism. (406,314.)
- 23,501. D. NAPIER AND SON, LTD., G. S. WILKINSON and C. W. SEWELL. Variable-speed transmission mechanism. (406,315.)
- 23,502. D. NAPIER AND SON, LTD., G. S. WILKINSON and C. W. SEWELL. Variable-speed transmission mechanism. (406,316.)
- 24,604. BENDIX AVIATION CORPN. Controlling the burning of fuel in i.c. engines. (406,383.)
- 27,516. FERRY ENGINE CO., LTD., W. J. CRAMPTON and B. K. LICKFOLD. Cyl. heads for i.c. engines of compression-ignition or Diesel type. (406,402.)

APPLIED FOR IN 1933

Published March 22, 1934

- 5,959. FAIREY AVIATION CO., LTD., and D. L. H. WILLIAMS. Loading of aircraft. (406,477.)
- 6,933. DORNIER METALLBAUTEN GES. and C. DORNIER. Cooling of aircraft m. (406,485.)
- 11,162. FAIREY AVIATION CO., LTD., and A. G. FORSYTH. Electric starting means for i.c. engines. (406,502.)
- 14,109. D. NAPIER AND SON, LTD., and C. W. SEWELL. Brake mechanism. (406,517.)
- 14,110. D. NAPIER AND SON, LTD., and C. W. SEWELL. Brake mechanism. (406,518.)
- 17,435. AKT.-GES. C. P. GOERZ OPTISCHE ANSTALT and K. PETSCHFNIG. Machine gun sight for anti-aircraft defence. (406,544.)
- 21,217. P. BORM. Aerial bombs. (406,574.)
- 22,775. R. C. CROSS. Radiators. (406,584.)